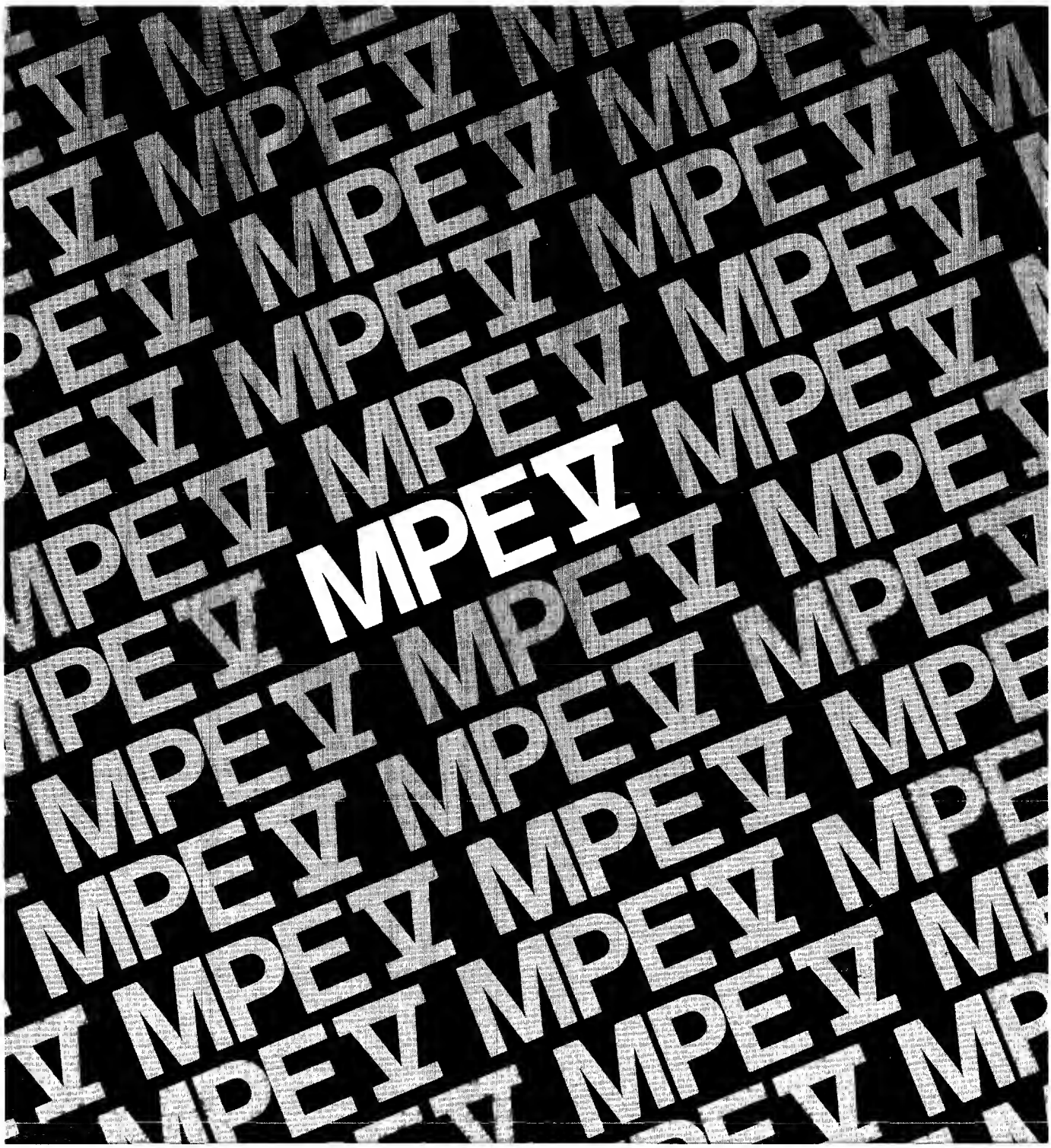
# HP 3000 Computer Systems

HEWLETT PACKARD

## MPE V Tables Manual for MPE V/E, Version G.01.00



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# MPE V TABLES MANUAL
# for MPE V/E, Version G.01.00

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**CAUTION**

The normal checks and limitations that apply to the standard MPE users are bypassed in Privileged Mode. It is possible for a Privileged Mode program to destroy file integrity including the MPE operating system software itself. Upon request Hewlett-Packard will investigate and attempt to resolve problems resulting from the use of Privileged Mode code. This service is available on a time and materials billing basis. However, Hewlett-Packard will not support, correct, or attend to any modifications of the MPE operating system software.

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First Edition . . . . . .January 1985

| **Effective Pages** | **Date** |
|---|---|
| ALL . . . . . | JAN 1985 |

# PRINTING HISTORY

New editions are complete revisions of the manual. Update packages, which are issued between editions, contain additional and replacement pages to be merged into the manual by the customer. The date on the title page and back cover of the manual changes only when a new edition is published. When an edition is reprinted, all the prior updates to the edition are incorporated. No information is incorporated into a reprinting unless it appears as a prior update.

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First Edition . . . . . JAN 1985 . . . . . G.01.00

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# CONTENTS (Continued)

# CONTENTS (Continued)

# CONTENTS (Continued)

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# CONTENTS (Continued)

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# PREFACE

The second edition of the MPE V/E Tables Manual describes the internal table organization of the MPE V operating system. It is intended for the technically sophisticated user with Privilege Mode capability. We strongly discourage modifying the table structure because you may destroy the operating system. The following caution applies:

**CAUTION**

The normal checks and limitations that apply to the standard MPE users are bypassed in Privileged Mode. It is possible for a Privileged Mode program to destroy file integrity including the MPE operating system software itself. Upon request Hewlett-Packard will investigate and attempt to resolve problems resulting from the use of Privileged Mode code. This service is available on a time and materials billing basis. However, Hewlett-Packard will not support, correct, or attend to any modifications of the MPE operating system software.

The major highlights of this edition include:

- A new chapter (24), "Native Language Support". It includes all of the character sets to support the installed languages.
- Expanded Chapter 15. It now includes Native Language Support Application Message Facility.
- A new table, DEFDATA Table. It describes the default configuration for for HP-IB devices. This table is located in Chapter 16.
- A new table, Process Job Cross Reference Table. It determines the job/session main process (Command Interpreter) for any process on the system. This table is located in Chapter 8.
- Additional fields support cartridge tape, job scheduling and all other features of release G.01.00. Many chapters reflect these changes.

We hope you will find this edition informative. Your comments and suggestions are welcome via the "Reader Comment Sheet" at the back of this manual.

CHAPTER 1 MEMORY LAYOUT

Fixed Low Memory (Series 44/48/64/68)

| % | | DEC | |
|---|---|---|---|
| 0 | CSTB (BASE OF CST TABLE)** | 0 | |
| 1 | KCSTB (POINTER TO CURRENT EXECUTING PROGRAM BLOCK) | 1 | |
| 2 | DSTB (BASE OF DST TABLE)** | 2 | |
| 3 | D | 3 | |
| 4 | CPCB (CURRENT PCB INDEX )** | 4 | >PCB AEL |
| 5 | QI (INITIAL Q FDR ICS)** | 5 | |
| 6 | ZI (INITIAL Z FDR ICS)** | 6 | |
| 7 | SYSTEM INTERRUPT MASK WORD** | 7 | |
| 10 | DRTBANK (BANK OF DRT TABLE) | 8 | |
| 11 | DRTADDR (BASE OF DRT TABLE) | 9 | |
| 12 | DBBANK (FOR INITIAL'S STACK) * | 10 | |
| 13 | DB (FOR INITIAL'S STACK) * | 11 | |
| 14 | | 12 | |
| 15 | | 13 | |
| 16 | | 14 | |
| 17 | | 15 | |
| 20 | | 16 | |
| 21 | LR (INTERRUPT INTERVAL)+ | 17 | |
| 22 | TEMPLR (TEMP STORAGE OF LIMIT REG)+ | 18 | |
| 23 | LR (SYSTEM CLOCK LIMIT REGISTER) ** | 19 | |
| 24 | ////////////////////////////////////////////// | 20 | |





Fixed Low Memory (Series 44/48/64/68) (Cont.)

| | | |
|---|---|---|
| 25 | TR (TIME SINCE LAST SOFT TIMER INTERRUPT)** | 21 |
| 26 | SCST (SYSTEM CLOCK STATUS)** | 22 |
| 27 | SCLC (SYSTEM CLOCK LAST COUNT)** | 23 |
| 30-37 | | 24-31 |

NOTE: All pointers are absolute addresses.

LEGEND: ** Needed by Firmware and/or by System, always
* Needed during INITIRL
\+ Needed by MPE, set up by INITIRL or PRDGENITDA.





System Global Area

| DCTAL | 1 2 3 4 5 6 7 8 9 D 1 2 3 4 5 | NAME |
|---|---|---|
| 0 | SYSGLOB | |
| 1 | CST BASE | CST |
| 2 | DST BASE | DST |
| 3 | PCB BASE | PCB |
| 4 | SWAPTAB BASE | SLL |
| 5 | IDQ BASE | IDQ |
| 6 | SBUF BASE | BUF |
| 7 | ICS QI | ICS |
| 10 | LPDT BASE | LPDT |
| 11 | SMDN BASE | SMDN |
| 12 | TRL BASE | TRL |
| 13 | JCUT BASE | SIR |
| 14 | SIR BASE | SDCTAB |
| 15 | JPCNT BASE | JPCNT |
| 16 | TBUF BASE | BUF |
| 17 | DISC REQUEST BASE | DRQ |
| 20 21 | FIRST FREE MEMORY ADDRESS | |
| 22 23 | TIME OF LAST CYCLE | |
| 24 | RESERVED | |
| 25 | Break Point Flag | BPTF |

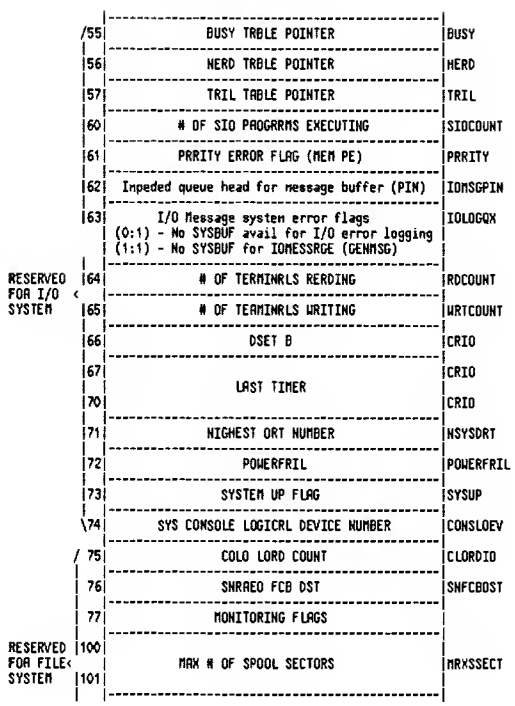




System Global Area (Cont.)

| | | |
|---|---|---|
| 26 | VDSMTAB BASE | VDSMTAB |
| 27 | STRTIC FENCE | |
| 30 | CURRENT CST BLOCK INDEX | CSTBX |
| 31 | MERSID BASE | MERSID |
| 32 | DISPLACEMENT TO CODE =@CST(0)-@DST(0) | DFC |
| 33 | DISPLACEMENT TO SNRRRBLE = @CST(LAST)-@DST(0) | DFS |
| 34 | Smon Index | |
| 35 | ABS ADDRESS (SYSDIT(B)) | DITB |
| 36 | Reserved | SBANK |
| 37 | RBS ADR OF PMBC TABLE FOR LST/STT CHECKING | SBASE |
| 40 | RESERVED FOR INITIAL (VDSENTRY) | |
| 41 | RESERVED FOR INITIAL (VDSMAP) | |
| 42 | SRTTAB BASE | SRTTAB |
| 43 | SPECQ HEAD | SPECQHERD |
| 44 | Number of Available Regions | NDLECDUNT |
| 45 | # PAGES IN LARGEST CURRENTLY AVAILABLE REGION | MAXAVAILREG |
| 46 | MAKE OVERLAY CANDIDATE INFORMATION | MDCINFO |
| 47 | NUMBER OF MEMORY BANKS CONFIGURED -1 | NBANKS |
| 50 | SCHEDULER TO AWAKE MESSAGE | SCHEDTOAWAKEMSG |
| 51 | POINTER TO CSTBLK TABLE | CSTXBLCKPOINTER |
| 52 | AWAKE TO SCHEDULER MESSAGE | AWAKETOSCHEDMSG |
| 53 | WAIT TO SCHEDULER MESSAGE | |
| 54 | CURRENT ACTIVITY'S PRIORITY | CURACTPRI |

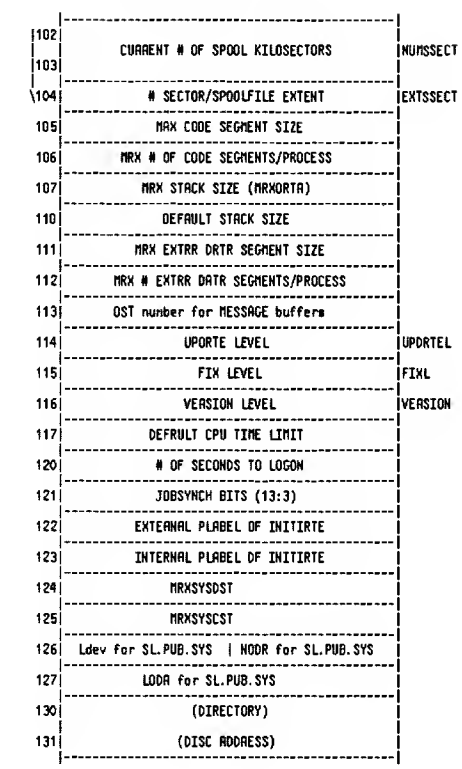
System Global Area (Cont.)








System Global Area (Cont.)





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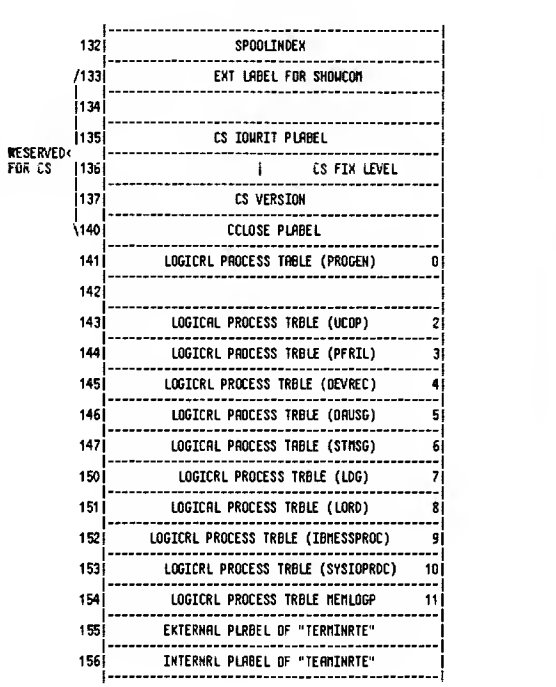






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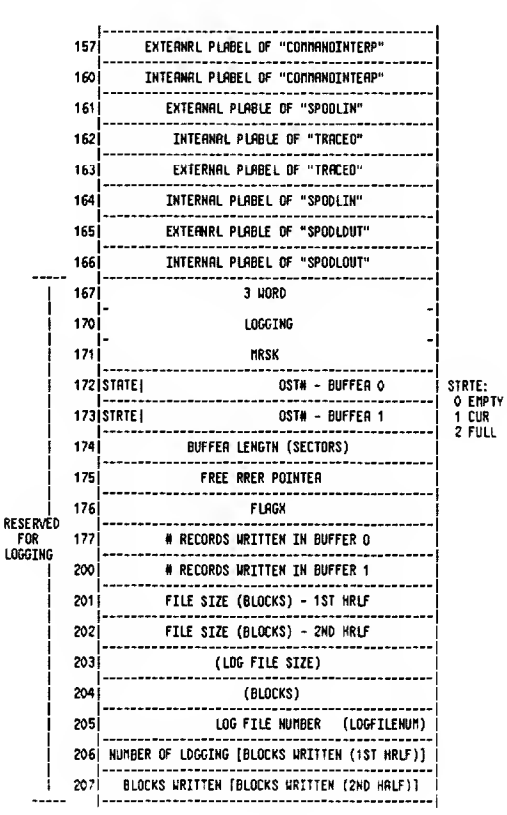
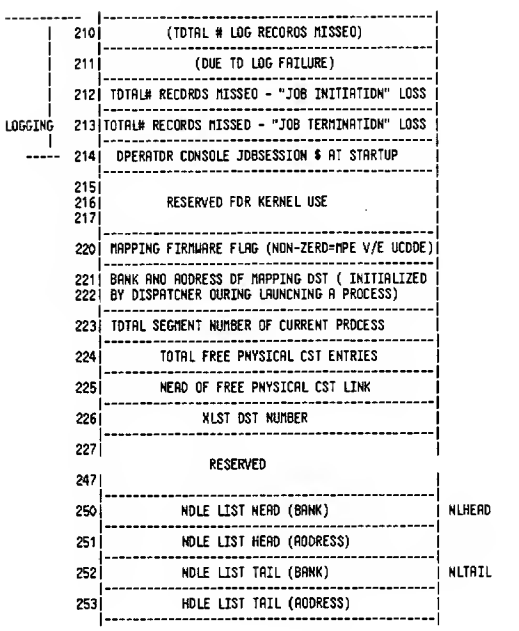


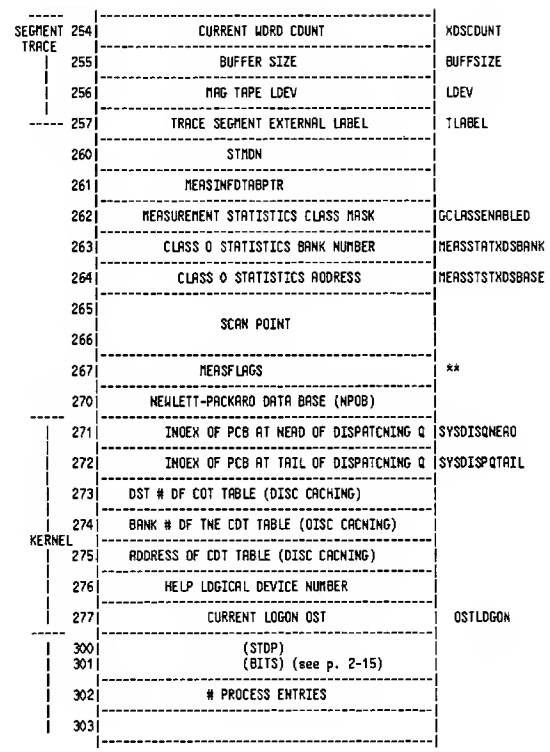
System Global Area (Cont.)







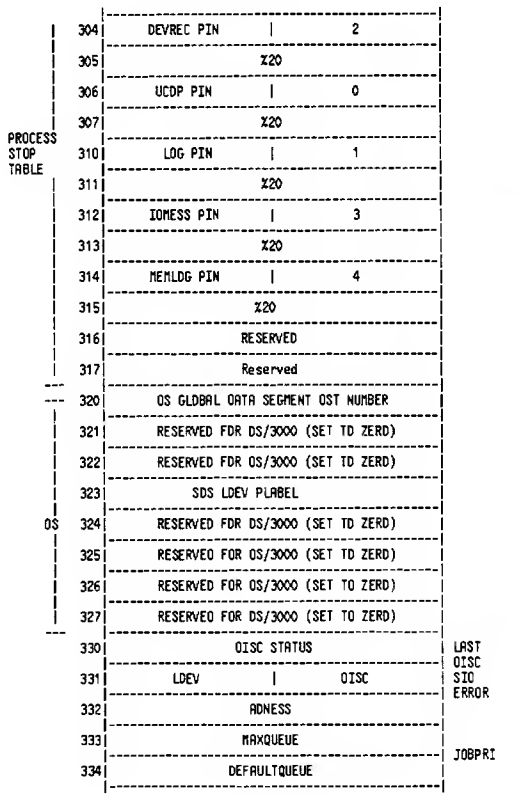

System Global Area (Cont.)







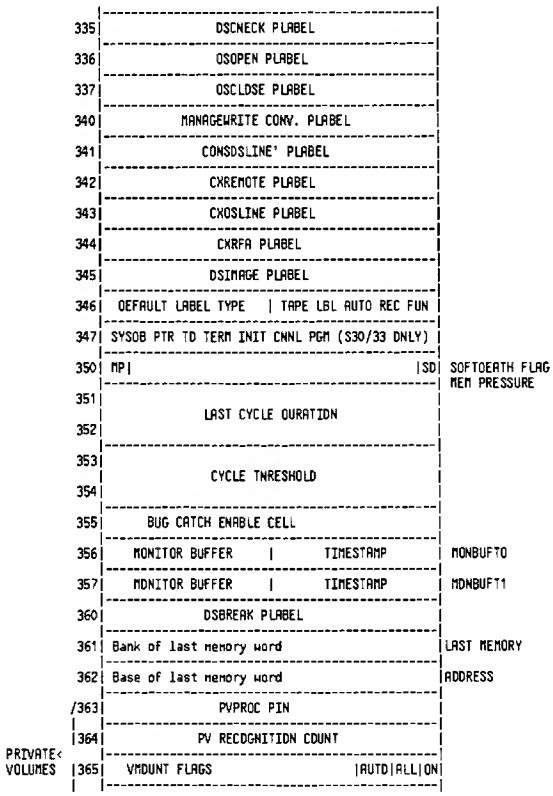

System Global Area (Cont.)








System Global Area (Cont.)



System Global Area (Cont.)

| | | |
|---|---|---|
| 366 | | |
| 367 | | |
| \370 | | |
| 371 | MSG CATALOG LOEV | |
| 372 | MESSAGE CATALOG OISC ADDRESS | |
| 373 | MSG OST | |
| 374 | CONSMPLINE' PLABEL | |
| 375 | CONSMRJE PLABEL | |
| 376 | SYSTEM LEVEL UOC FLAG (1 = SYS UOC'S EKIST) | |
| 377 | SYSOB RELATIVE POINTER TO SYSGLOB EKTENSION | |
| 400 | CPU NUMBER ( Set by softdump ) | |
| 401 | MICROCODE MEMORY LOCATIONS | |
| | *NOTE THAT THE CONTENTS OEPEND ON THE TYPE OF CPU THRT MPE IS RUNNING AND WHETHER A OUMP, POWERFAIL, OR CNTL B/HALT HAS OCCURREO | |
| 402 | | |

The following locations refer all systems:

```
X1401 = OUMPOEVOAT                  X1410 = S - BANK
   02 = X                            1411 = Z
   03 = OL                           1412 = STATUS
   04 = OB - BANK                    1413 = PB - BANK
   05 = OB                           1414 = PB
    6 = Q                            1415 = P
    7 = SM                           1416 = PL
                                     1417 = CIR
                                     1420 = High Bank
```

The following locations refer exclusively to the Series 37:

```
X1421 = MICROCODE VERSION NUMBER
        BIT (0:2)  00 = MRSTER RELERSEO
                   10 = PENOING RELEASE
                   11 = EKPERIMENTAL
        BIT (2:6) BASE LEVEL (1-64)
        BIT (8:8) PATCH LEVEL (1-99)
X1422 = FLAGS/MISC
```





```
        BIT (0:1)  1 IF ON ICS
        BIT (1:1)  1 IF IN OISPATCHER
        BIT (2:1)  LOGICAL/PHYSICAL
                     1 IF LOGICAL
        BIT (3:1) 1 IF CHRNNEL PROGRAM IS RUNNING

        8IT(4:1) SPLIT BANK FLAG
                   1 IF SPLIT
        8IT(5:3) UNUSEO
        8IT(8:8) LAST STOP CODE

X1423/7377 = CHANNEL PROGRAM ARER FOR BOOTING SOFTWARE
             (USEO ONLY OUAING BOOT).
```

The following are assignments after software has been loaded and launched:

```
X1540/1617 = ROM INPUT BUFFER FOR TERMINRL I/O
 1620/1677 = ROM OUTPUT BUFFER FOR TERMINRL I/O
 1700/1710 = ROM CONTROL BUFFER FOR TERMINRL I/O
 1711/1737 = ROM CONTROL B INTERFRCE BUFFERS
```

The following assignments refer to the Series 30/33/39/40/42/44/48/64/68:

```
    30/33/39/40/42/44/48                      64/68

X1421 = SYSTEM MRLT #              X1421 = CPX1 REGISTER
 1422 = ISR (INTERRUPT REGISTER)    1422 = CPX2 REGISTER

X1515 = SYSTEM INTERRUPT MASK      X1515 = NIR REGISTER
 1516 = ORT 0
 1517 = ORT 1
 1520 = ORT 2
 1521 = ORT 3                                37/64/68

                                    1516 = ORT 0
                                    1517 = ORT 1
                                    1520 = ORT 2
                                    1521 = ORT 3
                                    1522 = ORT BRNK
                                    1523 = ORT RDORESS OFFSET
                                    1524 = INTERRUPT MRSK FOR IMB0
                                    1525 = INTERRUPT MRSK FOR IMB1
                                    1526 = INTERRUPT MRSK FOR IMB2
                                    1527 = INTERRUPT MRSK FOR IMB3
```

All Systems:

```
1740      = START OF SYSGLOB EKTENSION
```





SysGlob Extension

X200 words long; Pointer found at SysOB + X377

| | | |
|---|---|---|
| % 0 | SWAP QUEUE DELAY (*100MS) | SWAPOOELAY |
| 1 | BANK OF FIRST REGION IN LINKEO MEMORY | FIRST MEMORY |
| 2 | BASE OF FIRST REGION IN LINKEO MEMORY | REGION |
| 3 | GARBAGE COLLECTION ENABLE FLAG | GARBCOLLENAB |
| 4 | MOVE THRESHOLO (IN PAGES, FOR GARB COLL) | MOVETHRESH |
| 5 | MAIN MEMORY PAGE SIZE (IN WORDS) | |
| 6 | VOS PAGE SIZE | |
| 7 | LAST MAKE ROOM TIME | |
| 10 | | |
| 11 | MEMORY PRESSURE OURATION THRESHOLD | |
| 12 | NATIVE LANGUAGE TABLE (NLT) OST # | |
| 13 | RESERVEO FOR NATIVE LANGUAGE SUPPORT | |
| 14 | BAUO RATE OF THE SYSTEM CONSOLE | |
| 15 | ////////////////////////////////////////////// | |
| 16 | PLABEL FOR REMOTE'MPE | |
| 17 | PLABEL FOR GETOS'NODENAME | |
| 56 | | |
| 57 | ////////////////////////////////////////////// | |
| 60 | PLABEL USERLOG (EXTERNAL) | |
| 61 | PLABEL USERLOG (INTERNRL) | |
| 62 | PLABEL RECLOG (EXTERNRL) | |

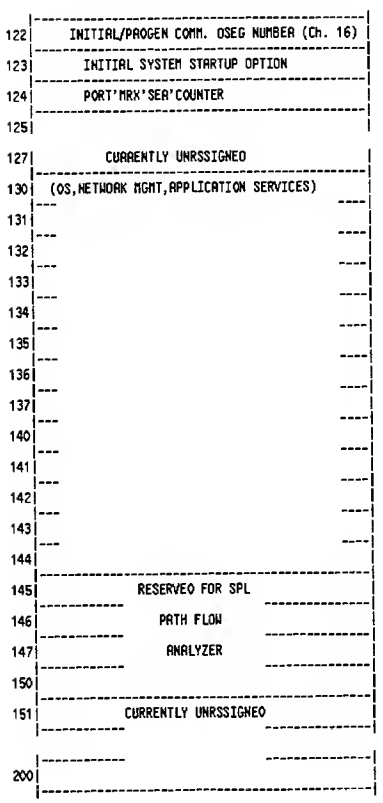




SysGlob Extension (Cont.)

| | | |
|---|---|---|
| 63 | PLABEL RECLOG (INTERNAL) | |
| 64 | PLABEL RESTART (EKTERNAL) | |
| 65 | PLABEL RESTART (INTERNAL) | |
| 66 | PMBC LOW CORE BANK # (USER) | |
| 67 | PMBC LOW CORE ADDRESS (USER) | |
| 70 | RESERVED FOR IMAGE | |
| 71 | RESERVED FOR MERSID 12 MIOCNT | * |
| 72 | LORDER CRONE SEGMENT NUMBER | |
| 73 | PLABEL 3270 (EXTERNAL) | |
| 74 | VERSION | |
| 75 | UPDATE | |
| 76 | FIX | |
| 77 | COUNT OF TRPE CONTROLLERS USING MERSIO | |
| 100 | PORT DATA SEGMENT NUMBER | |
| 101 | RESERVED FOR SECONO PORT DATA SEGMENT | |
| 102 | SYSTEM FPMAP OPTION FLAG | SYSFPMAP |
| 103 | | |
| 104 | GLOBAL | |
| 105 | ALLOW | |
| 106 | MASK | |
| 107 | | |
| 110 | | |
| 111 | RESERVED | |
| 117 | | |
| 120 | SYS PORT PROCESS PCB RELATIVE INDEX | |
| 121 | GLOBAL AFT OST NUMBER | |

SysGlob Extension (Cont.)








* MIOCNT = MERSIOCOUNT (3 BITS)
** MEASFLAGS (15:1) = 1 ==> MONITOR ENABLED
(14:1) = 1 ==> BUFFER FLIP/FLOP
(13:1) = 1 ==> EOT ON MONITOR TAPE

SYSOB Words

System tables may be accessed by using the LST/SST instructions. Pointers have the following format:




Rddress is the whole word with "Bank" masked out to 00000.

Systems that have MPE V/E microcode (all 6X systems, 4X systems with new boards) can have a non-zero bank number. Systems running pre-MPE V/E microcode can only use bank 0, therefore the pointer will look like:




SysGlob Word Definitions

| RODRESS | NAME | FUNCTION |
|---|---|---|
| OB+55 | BUSY | - SYSOB relative pointer to BUSY TABLE for I/O resources |
| OB+56 | HERO | - SYSOB relative pointer to table containing head pointers to I/O resource queues |
| OB+57 | TAIL | - SYSOB relative pointer to table containing head pointers to tail of I/O resource queues |
| OB+60 | SIO COUNT | - Number of I/O Programs currently executing |
| OB+72 | POWER FAIL | - 0-no power fail<br>1-system disc recovery<br>2-all other disc recovery<br>3-all other device recovery |
| OB+73 | SYSUP | - System is up and operable |
| OB+74 | CONSLDEVN | - System console logical device number |
| OB+400 | CPU NUMBER | - Set when system aborts |





JOBSYNCH job synchronization via jobsynch (sysglob+121(8))

(13:1) - JOBSREADY - set by DEVREC & MORGUE (via procedure STRATDEVICE) indicating a ready job. This prevents UCOP from going to a wait state when a job is just made ready.

(15:1) - DEVFREED - set by DEALLOCATE when device count goes to 0.

NOTE - Both bits above used for synchronization of job-made-ready or devicefreed when UCOP is running.

(14:1) - JOBSWAITING- set by UCOP just before waiting if any job is waiting for list device. Signals DEALLOCATE to awake UCOP when a device is freed.





RIlow Mask Format

The RIlow mask for MPE V is expanded to six words. There is a mask in each user's JIT and in the SYSGLOB area. The RIlow mask contains enough bits for a one-to-one correspondence to every present OPERATOR type command, or any future OPERRTOR command. When a user is RLLOWed any OPERRTOR command or RSSOCIRTed to a device (which will use OPERRTOR type commands) then the corresponding bit(s) in the mask in that user's JIT for that command is set. If the RLLOW or RSSOCIRTE was done on a global scale, then the bit(s) in the mask of the SYSGLOB area is/are updated.

The following EQUATEs define the mask bit for each operator command.

The first set of commands define the operator commands dealing with devices.

When adding a new command to this set of EQURTEs, be sure to add a corresponding move statement in LOGIMAGE, even if the command will not be logged.

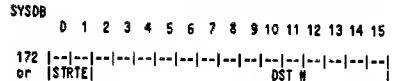
| | Word | Bit | # |
|---|---|---|---|
| ABORTIO | 0 | 0 | 0 |
| ACCEPT | 0 | 1 | 1 |
| DOWN | 0 | 2 | 2 |
| GIVE | 0 | 3 | 3 |
| HEADOFF | 0 | 4 | 4 |
| HEADON | 0 | 5 | 5 |
| REFUSE | 0 | 6 | 6 |
| REPLY | 0 | 7 | 7 |
| STARTSPOOL | 0 | 8 | 8 |
| TAKE | 0 | 9 | 9 |
| UP | 0 | 10 | 10 |
| MPLINE | 0 | 11 | 11 |
| OSCONTROL | 0 | 12 | 12 |
| UPPER LIMIT->DEVICE COMMANDS | | | |
| ABORTJOB | 0 | 13 | 13 |
| RLLOW | 0 | 14 | 14 |
| ALTFILE | 0 | 15 | 15 |
| ALTJOB | 1 | 0 | 16 |
| BREAKJOB | 1 | 1 | 17 |
| DELETE | 1 | 2 | 18 |
| DISALLOW | 1 | 3 | 19 |
| JOBFENCE | 1 | 4 | 20 |
| LIMIT | 1 | 5 | 21 |
| STOPSPOOL | 1 | 6 | 22 |
| SUSPENDSPOOL | 1 | 7 | 23 |
| OUTFENCE | 1 | 8 | 24 |
| RECALL | 1 | 9 | 25 |
| RESUMEJOB | 1 | 10 | 26 |
| RESUMESPOOL | 1 | 11 | 27 |
| STREAMS | 1 | 12 | 28 |
| CONSOLE | 1 | 13 | 29 |

## Allow Mask (Cont.)

| | Word | Bit | # |
|---|---|---|---|
| WARN | 1 | 14 | 30 |
| WELCOME | 1 | 15 | 31 |
| MON | 2 | 0 | 32 |
| MOFF | 2 | 1 | 33 |
| VMOUNT | 2 | 2 | 34 |
| LMOUNT | 2 | 3 | 35 |
| LDISMOUNT | 2 | 4 | 36 |
| MRJECONTROL | 2 | 5 | 37 |
| JOBSECURITY | 2 | 6 | 38 |
| DOWNLOAD | 2 | 7 | 39 |
| MIOENABLE | 2 | 8 | 40 |
| MIODISABLE | 2 | 9 | 41 |
| LOG | 2 | 10 | 42 |
| FOREIGN | 2 | 11 | 43 |
| IMF | 2 | 12 | 44 |
| SHOWCOM | 2 | 13 | 45 |
| OPENQ | 2 | 14 | 46 |
| SHUTQ | 2 | 15 | 47 |
| DISCRPS | 3 | 2 | 48 |

## Logging Related Locations

SYSDB




STRTE = 0 if respective buffer empty
1 if respective buffer is current
2 if respective buffer is full

## FLAGX

SYSDB

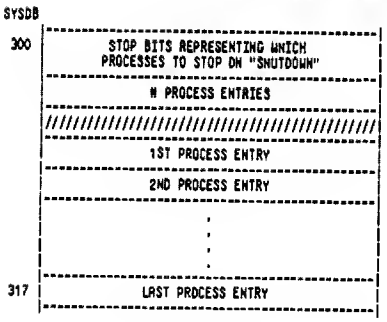

SF = 1 if soft failure
MF = 1 if hard failure
BUF = 0 if current log buffer is buffer 0
= 1 if current log buffer is buffer 1
SL = 1 to indicate a switch in log buffers (from 0 to 1 or from 1 to 0)
SO = 1 to indicate shutdown in progress



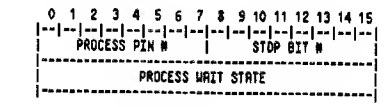


## Process Stop List General Layout

SYSDB




## Entry Format




## Preassigned Entries

| entry # | process | stop bit # |
|---|---|---|
| 1 | devrec | 2 |
| 2 | ucop | 0 |
| 3 | log | 1 |





## Initial Memory Allocation

Thie eection is a description of the method used by INITIAL to allocate memory for MPE tablee and code eegmente in MPE V/E. All memory allocated by INITIAL is permanently allocated. All non-core resident code and data is put on disc before exiting INITIAL.

At the most baeic level INITIAL will try to build memory to look exactly ae diagramned below. There are, however, several ways in which to deviate from this etructure. Before going into the sources of theee deviatione, it ie necessary to point out which portione of memory are used by INITIAL during the restart and therefore cannot be used by MPE until INITIAL hae finiehed.

Before INITIAL begine to allocate any nemory space, it relocates its core resident code, ite code segment ewapping area and ite stack to the highest configured memory space. Rdditionally, it uses the last %326 words of bank 0 on series 4x machinee for its I/O buffer area and tenporary code segment table. Rfter INITIAL has built all of core resident MPE (tablee and code), it builds the disc resident MPE tables. Since some of the disc resident tables nay be too large to be built in INITIAL's stack, these tables are built in unused nemory space. Therefore, in addition to the nemory space required for INITIRL'e code, INITIAL's stack and core resident MPE, there nuet be enough space left in which to build the largeet of the diec resident tables.

For Series 6x nachines with the MPE V/E firmware, INITIAL will build the tables with ">" eigns by then out of Bank 0 if necessary. For all other tables, INITIAL will eseentially build nemory in the order shown below. There nay be an unwsed fragnent of nemory between the DRT'e and the eyeten global area which INITIAL will fill with the enaller tables. Neither the tablee narked with an asterisk nor the code segmente will ever be put in thie area. NOTE: INITIAL will build all tablee on 32-word boundaries.

If the eyeten being built by INITIRL ie configured with 128K words or 160K words of nemory then INITIAL'e stack will be in bank 1 (the code also on a 128K word nemory eize). If INITIAL is occupying part of bank 1 and the space is needed for a core resident MPE code segnent or to build a disc resident table then INITIAL will print the error nessage "ERROR #350 OUT OF MEMORY".

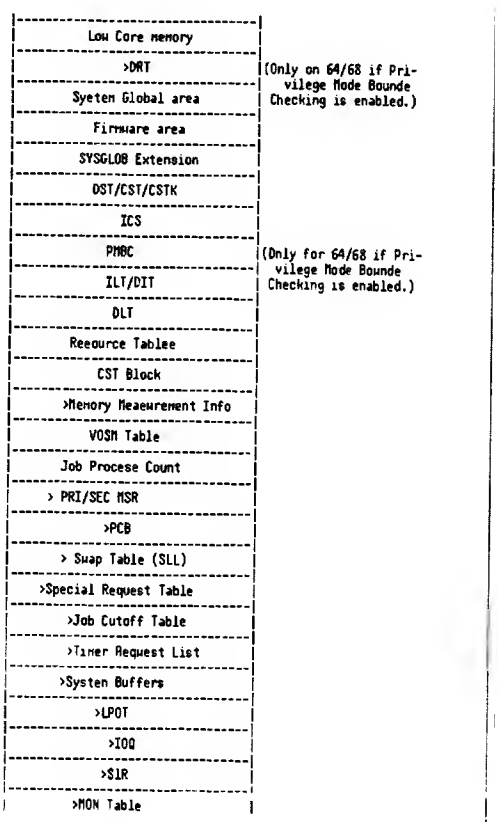
Except for the exceptions etated above, for every allocation of nemory INITIAL will first try to allocate any renaining space between the ORT's and SYSGB. It will then try the next available space in bank 0, then the next available space in bank 1. If it were necessary it could continue eearching until all all banke were checked for available epace.

Innediately before exiting INITIAL, INITIAL lays down all the nemory region headers and trailers as ehown below. For any one bank of nemory there will only be one block of core resident MPE, regardlees of its contents. The only block of core resident MPE that does not have a reserved region global header is in bank 0. It does have the reserved region global trailer though. Before placing any code outside bank 0 the first 24 words of every bank (except bank 0) is reserved for the region global header.

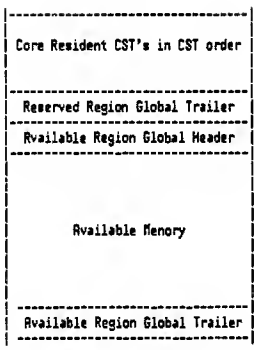




## Bank 0

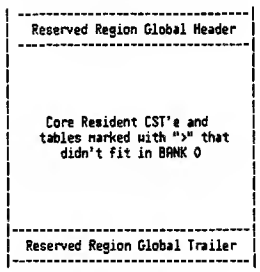


Bank 0 (Cont.)




NOTE: The > means these tables can move out of Bank 0 if necessary.

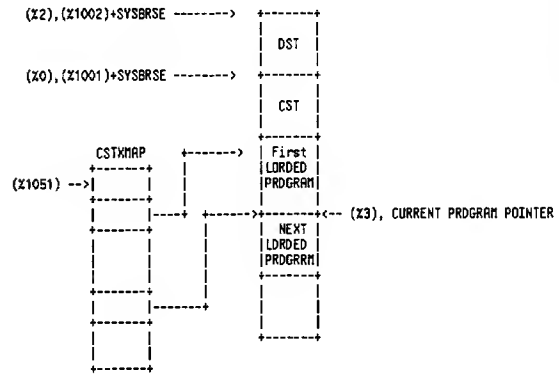
Bank 1



## CHAPTER 2 MEMORY MANAGEMENT TABLES

### Segment Table Structure

The current location and state of each data segment and loaded code segment is maintained in the Segment Table. This table is partitioned into three separate tables as shown in Figure 2-1. The partitions are based on the segment classes: a segment is a data segment, a segment is a system SL segment, or a segment is part of a program. The structure and format of each partition is described in the following.




Overall ST Structure





### Pointers and OST #'s of Segment Table Components

i. DST

%2 absolute address of entry 0 of the DST.
%1002 sysbase relative index of entry 0 of DST.
DST number 2 is the DST Table dst #.

ii. CST

%0 absolute address of entry 0 of System SL.
%1001 sysbase relative index of entry 0 of System SL.
%1032 displacement from DST base of entry 0 of System SL (i.e. @CST(last) - @DST(0) = DFS ).
DST number 4 is the CSTX Table DST #.

iii. CSTX

%1 absolute address of entry 0 of current program.
%1033 displacement from DST base to first CSTX entry SL.
DST number 4 is the CSTX Table DST #.

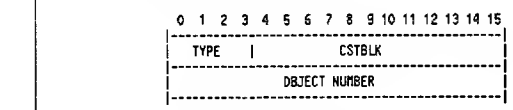
iv. CSTXMAP

%1051 sysbase relative index of entry 0 of CSTXMAP.
DST number 43 (%72) is CSTXMAP Table DST #.





### Standard Object Identifier Format

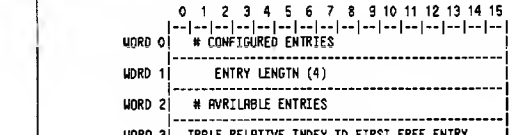



OBJIDENTIFIER(0).(0:4) ==> TYPE
= 0 Object is a Data segment
= 1 Object is an SL segment
= 2 Object is a Program segment
= 3 Object is a Cache Domain

OBJIDENTIFIER(0).(4:12) ==> Program index into CSTXBLK
OBJIOENTIFIER(1).(0:16) ==> Number field:
DST, CST, CSTX, or CDT number

### OST Entry Formats

OST/CST Entry 0 Format

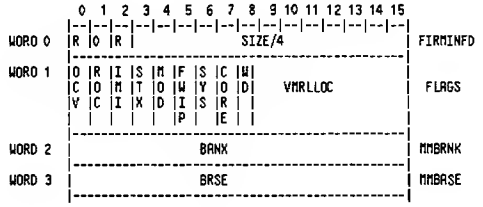




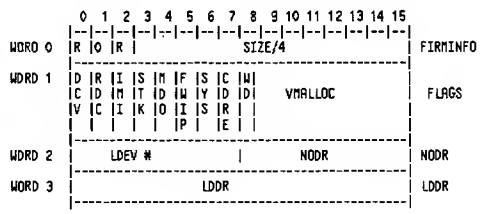



### OST General Entry Format

Case (i) DST Entry for a Present Data Segment



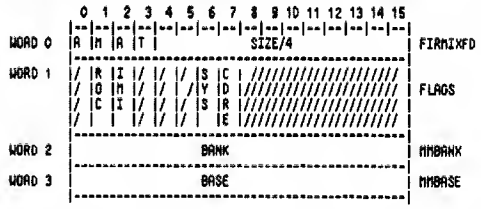

Case (ii) DST Entry for an Absent Data Segment



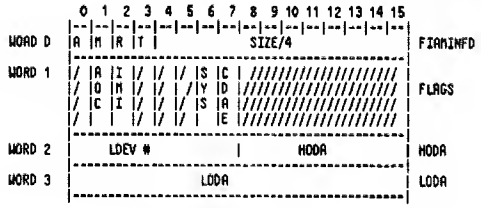
## CST Entry Formats

CST General Entry Format

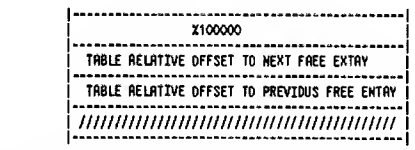
Case (i) CST Entry for a Present SL Segment or CSTX Segment




CASE (ii) CST Entry For An Absent Segment SL or CSTX Segment




Case (iii) DST/CST Free Entry




Refer to the Logical Segment Table Format in Chapter 11 for more information on XCST.

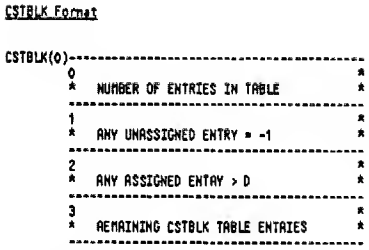




## ST Entry Field Descriptions

A = 1 ==> segment absent
M = 1 ==> segment privileged
R = 1 ==> segment has been referenced
T = 1 ==> segment is being traced
DCV = 1 ==> disc copy is valid
STK = 1 ==> segment is a stack
MOD = 1 ==> a segment modification (exp., contr.) is pending
FWIP= 1 ==> a forced write of this segment is in progress
VMPAGECNT = # of virtual memory pages allocated to this segment
ROC = 1 ==> segment is recoverable overlay candidate
IMI = 1 ==> segment is in motion in
SYS = 1 ==> segment is a system segment
CORE= 1 ==> segment is core resident
WD= 1 ==> write disabled

## CSTBLK Format




The table is initialized to minus one in each entry. When selected, the entry is replaced by a DST-relative index to the entry #0 of the CST extension block. This is the the overhead entry for the associated program.

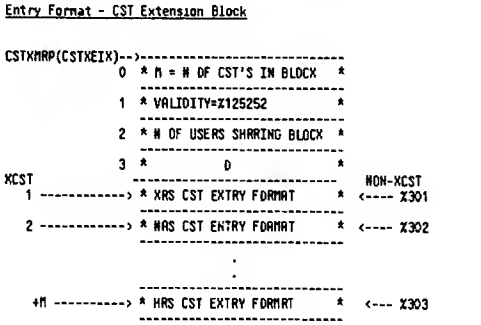




## Program Blocks and the CSTXMAP

Since programs can be dynamically loaded and unloaded, the segment table must be kept packed or fragmentation would occur. Thus, the block of ST entries for a program segment begins at an ST entry number that changes if a program which was loaded before it gets unloaded. To manage this dynamic structure, an auxiliary structure, the CSTXMAP is used. A program is identified by its index, CSTXEIX, into this map. The program's current beginning physical ST entry number is equal to equal to CSTMAP (CSTXEIX).

Entry Format - CST Extension Block




The value of CSTXEIX is established when a CST extension block is allocated. This index into the array CSTXMAP is maintained in the PCB of each process sharing the block.





## Fixed DST Entry Assignments

| OCTRL | | DECIMAL | TABLE NAME |
|---|---|---|---|
| 0 | | 0 | |
| 1 | CST | 1 | CST |
| 2 | DST | 2 | DST |
| 3 | PCB | 3 | PCB |
| 4 | CSTX | 4 | CSTX |
| 5 | SYSTEM GLOBAL AREA | 5 | SYS |
| 6 | CORE | 6 | CORE |
| 7 | ICS | 7 | ICS |
| 10 | SYSTEM BUFFERS | 8 | SBUF |
| 11 | UCOP REQUEST QUEUE | 9 | UCAD |
| 12 | PROCESS-PROCESS COMMUNICATION TABLE | 10 | PPCOM |
| 13 | I/O QUEUE | 11 | IOD |
| 14 | TERMINAL BUFFERS | 12 | TBUF |
| 15 | LOGICAL-PHYSICAL DEVICE TABLE | 13 | LPDT |
| 16 | LOGICAL DEVICE TABLE | 14 | LDT |
| 17 | DRIVER EXCHANGE TABLE | 15 | DLT |
| 20 | I/O RESOURCE TABLES | 16 | BUSY, HEAD, TAIL |
| 21 | SECONDARY MSG TABLE | 17 | SECMSGTAB |
| 22 | LOADER SEGMENT TABLE | 18 | LST |
| 23 | TIMER REQUEST LIST | 19 | TRL |
| 24 | DIRECTORY | 20 | DDS |

DST (Cont.)

| OCTAL | | DECIMAL | TABLE NAME |
|---|---|---|---|
| 25 | DIRECTORY SPACE | 21 | |
| 26 | RIN TABLE | 22 | RIN |
| 27 | SWAPTABLE (SLL) | 23 | SWAPTAB |
| 30 | JOB PROCESS COUNT | 24 | JPCNT |
| 31 | JOB MASTER TABLE | 25 | JMAT |
| 32 | TAPE LABEL TABLE | 26 | VOO |
| 33 | LOG TABLE | 27 | LOGTAB |
| 34 | REPLY INFORMATION TABLE | 28 | RIT |
| 35 | VOLUME TABLE | 29 | VTAB |
| 36 | BREAKPOINT TABLE | 30 | STOP |
| 37 | LOG BUFFER1 | 31 | |
| 40 | LOG BUFFER2 | 32 | |
| 41 | LOG ID TABLE | 33 | LIDTAB |
| 42 | ASSOCIATE TABLE | 34 | |
| 43 | CST BLOCK | 35 | CSTBLK |
| 44 | JOB CUTOFF TABLE | 36 | JCUT |
| 45 | SYSTEM JIT | 37 | SJIT |
| 46 | SPECIAL REQ TABLE | 38 | SRT |
| 47 | VIRTUAL DISC SPACE MANAGEMENT TABLE | 39 | VDSMTAB |
| 50 | DEVICE CLASS TABLE | 40 | DEVCLASS |
| 51 | Reserved Kernel | 41 | |





DST (Cont.)

| OCTAL | | DECIMAL | TABLE NAME |
|---|---|---|---|
| 52 | ILT | 42 | ILT |
| 53 | SIR TABLE | 43 | SIR |
| 54 | FMAVT | 44 | FMAVT |
| 55 | INPUT DEVICE DIRECT | 45 | IDD |
| 56 | OUTPUT DEVICE DIRECT | 46 | ODD |
| 57 | WELCOME MESSAGE #1 | 47 | LOGONDSTN1 |
| 60 | WELCOME MESSAGE #2 | 48 | LOGONDSTN2 |
| 61 | CS DATA SEGMENT | 49 | CSTAB |
| 62 | PROCESS-JOB CROSS REFERENCE | 50 | PJXREF |
| 63 | SYSTEM JDT | 51 | SYSJDT |
| 64 | COMMAND LOGON DST | 52 | CILOGDST |
| 65 | MOUNTED VOL. SET TABLE | 53 | MVTAB |
| 66 | PRI.VOL. USER TABLE | 54 | PVUSER |
| 67 | RESERVED KERNEL | 55 | |
| 70 | DISC REQUEST TABLE | 56 | DISCREQTAB |
| 71 | MSG NARBOR TABLE | 57 | MSGNARBTAB |
| 72 | PRIMARY MESSAGE TABLE | 58 | PRIMMSGTAB |
| 73 | MEASUREMENT INFO TABLE | 59 | MEASINFDTAB |
| 74 | FIRST FREE DST | 60 | |





## Swap Tables

The SWAPTAB is a core resident memory management table used to keep track of the locality lists of the competing processes. The PCB entry for a process has a SWAPTAB relative pointer to the header entry for the process.

SWAPTAB DST# = 23 (%27)

%1004 System table pointer to SWAPTAB entry 0.

NOTE: The number of entries configured will be 3 greater than the number configured via SYSDUMP. (Entry 0 consumes 3 entries).

SWAPTAB Entry 0 Format

| | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | |
|---|---|---|
| 0 | # ENTRIES CONFIGURED | 0 |
| 1 | ENTRY SIZE (6) | 1 |
| 2 | # AVAILABLE ENTRIES | 2 |
| 3 | TABLE RELATIVE INDEX OF FIRST FREE ENTRY | 3 |
| 4 | TABLE RELATIVE INDEX OF LAST FREE ENTRY | 4 |
| 5 | HIGH WATER MARK | 5 |
| 6 | # PRIMARY ENTRIES (0) | 6 |
| 7 | HEAD OF IMPEDED QUEUE (PCB RELATIVE) | 7 |
| 8 | TAIL OF IMPEDED QUEUE (PCB RELATIVE) | 10 |
| 9 | # CURRENTLY IMPEDED PROCESSES | 11 |
| 10 | MAX # OF IMPEDED PROCESSES | 12 |
| 11 | CUMULATIVE # OF IMPEDED PROCESSES | 13 |
| 12 | . . . | 14 |
| 17 | | 21 |





SWAPTAB Unassigned Entry Format

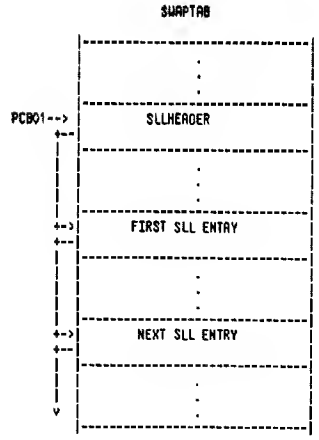
| | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 |
|---|---|
| 0 | %100000 |
| 1 | TABLE RELATIVE INDEX OF NEXT FREE ENTRY |
| 2 | TABLE RELATIVE INDEX OF PREV. FREE ENTRY |
| 3 | 0 |
| 4 | 0 |
| 5 | 0 |

An assigned entry in the swaptab is a process' SLL header or a member of a process' SLL. These formats are now described.

## Segment Locality Lists (SLL)

The system maintains for each process a segment locality list (SLL) of the segments belonging to that process' current working set. The process' SLL consists of a header and a list of entries. The header and list entries are taken from the SWAPTAB.

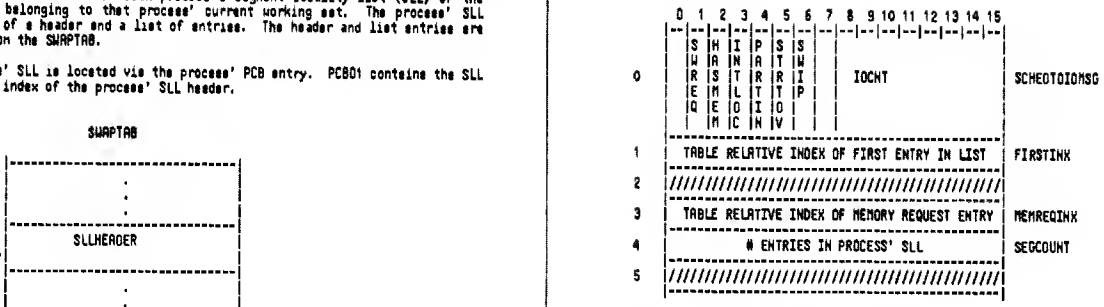
A process' SLL is located via the process' PCB entry. PCB01 contains the SLL relative index of the process' SLL header.








## SLL Header Format

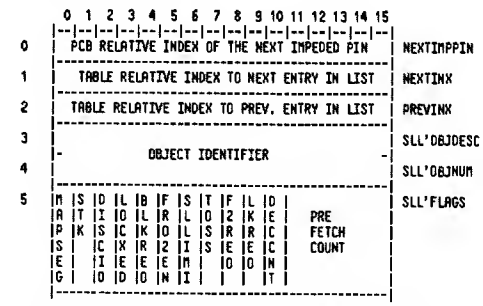



SLL(SLLHEADINX+0)
- .(1:1) SWREQ, Swap Required Flag
- .(2:1) NASMEM, Has Memory Flag
- .(3:1) INTLOC, Initialize locality to minimum
- .(4:1) PARTIN, Process partially swapped in
- .(5:1) STRTOV, Start swap over flag
- .(6:1) SWIP, Swap In Progress Flag
- .(8:8) IOCNT, Segment read completions until awake





## SLL List Entry Format




SLL(SLLINX+0) NEXTIMPPIN, next make present deferred queue PCB Index

SLL(SLLINX+1) NEXTINX, next SLL entry

SLL(SLLINX+2) PREVINX, previous SLL entry

SLL(SLLINX+3) SLL'OBJDESC, 1st word of object identifier

SLL(SLLINX+4) SLL'OBJNUM, 2nd word of object identifier

SLL(SLLINX+5)
- .(0:1) MAPSEG, process' CST mapping segment (LSTT)
- .(1:1) STK, process' stack entry
- .(2:1) DISCIOSEG, disc I/O pending on this segment
- .(3:1) LOCKED, segment locked in memory
- .(4:1) BLKLK, request for blocked lock
- .(5:1) FROZE, segment frozen in memory
- .(6:1) SLLIMI, process queued for this segment
- .(7:1) TOSS, Toss this entry
- .(8:1) FR2REQ, request segment to be frozen
- .(9:1) LKREQ, request to lock segment in memory
- .(10:1) DECCNTFLAG,
- .(11:5) PREFETCHCOUNT,

NOTE:
The Swap Table will be configured with at least twice the number of configured PCBs.





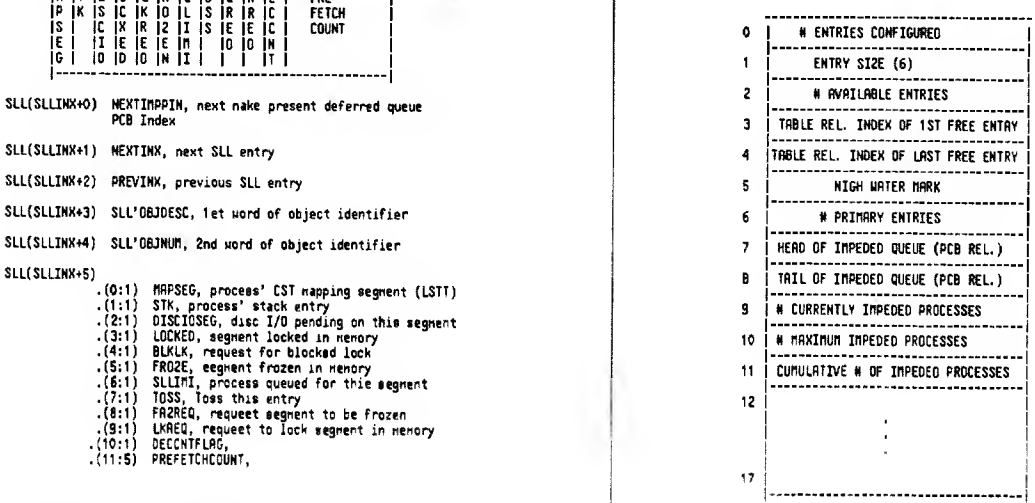
## Special Request Table

Used for passing data segment size change info and for keeping a list of devices waiting for a segment to arrive in memory.

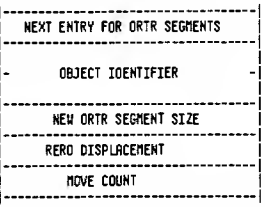
X1042 - SRT relative index to entry # 0
X1043 - SRT relative index to the head of the queue

NOTE: The number of entries configured will be 3 greater than the number configured via SYSDUMP. (Entry #0 consumes 3 entries).

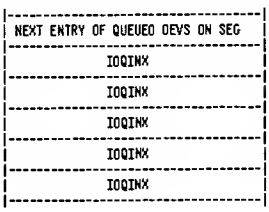
SRT Entry 0 Format



The following entry format is for data segment size changes:




The following is the format for devices waiting on a segment: (The region header for the segment contains an SRT relative index to this entry. If more that 5 devices are waiting on this segment, another entry will be linked to this entry.)




NOTE:
The number of primary configured entries will be equal to the total number of LDEVs configured. The number of secondary entries will be configured to be at least the same as the number of PCBs configured. Data segment change entries are secondary type, while devices queued entries will be primary entries.





## Main Memory Region Headers and Trailers

Main memory is partitioned into regions. Each region is in one of four states: available, reserved, assigned, or cached.

An available region is available for consumption by the free space allocation mechanism. An available region consists of neighboring subregions, each of which is either a hole or an overlay candidate. An available region is linked into the available region list.

A reserved region is a main memory region which is in the transition state from available to assigned. A reserved region has been cleaned, and there is a pending disc read of a segment into the region.

Assigned regions are occupied by present segments. Available and reserved regions consist of one or more adjacent subregions. Region headers and trailers are partitioned into global and local components. The global region header/trailer is only valid for the first/last subregion in regions consisting of more than one subregion.

The region headers and trailers of available, reserved, and assigned regions contain the state and control information pertaining to the current or planned contents of the region.

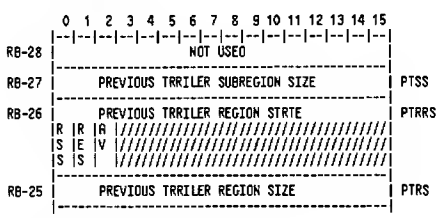
Cache domains are another form of assigned regions and are designated as such in the subregion header. If the cache domain is "mapped" (I/O pending against it) then the object identifier will have a non-zero value in the second word of the segment identifier field. If the second word of the segment identifier field is zero, then this region is a cache domain that is unmapped. (Refer to Chapter 23 for further information regarding Disc Caching.)



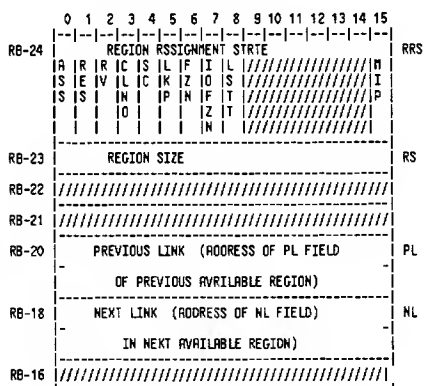


Header length = 24
Trailer length = 4

Global Region Trailer



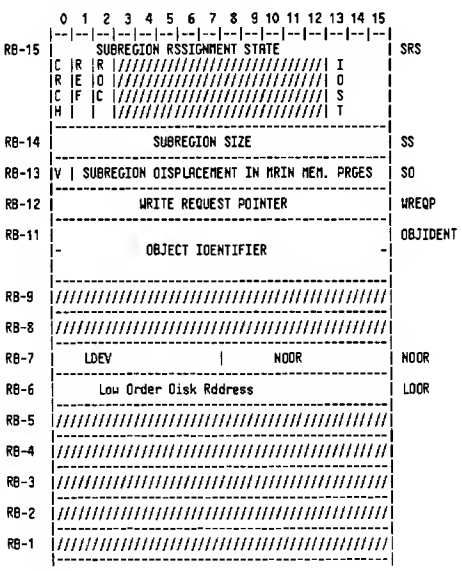

Global Region Header (Available Regions)



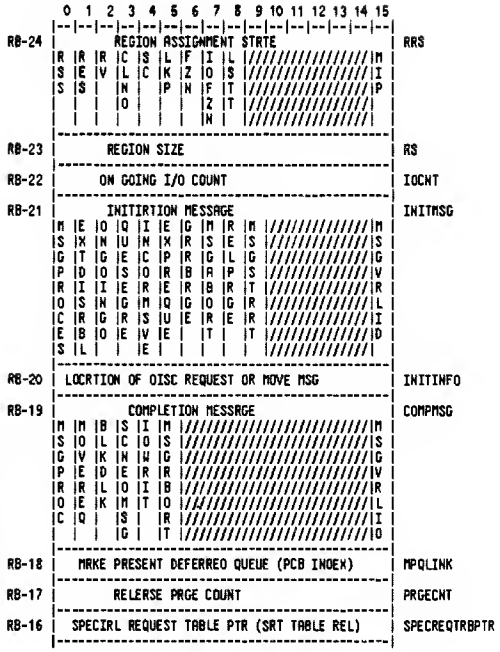





Subregion Header (Available Regions)



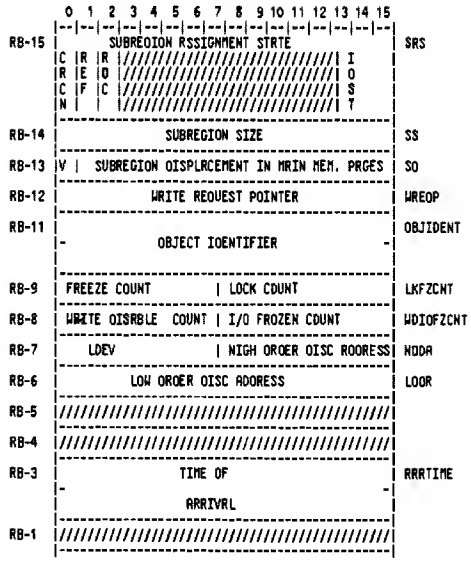
Global Region Header (Reserved Regions)







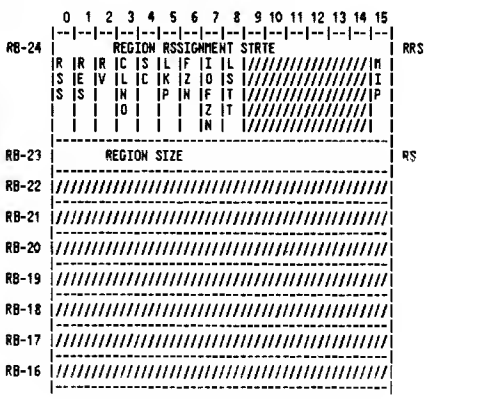

Subregion Header (Reserved Regions)







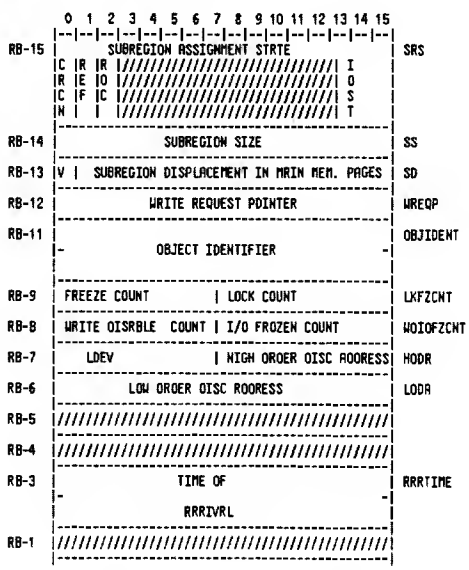

Global Region Header (Rssigned Regions)



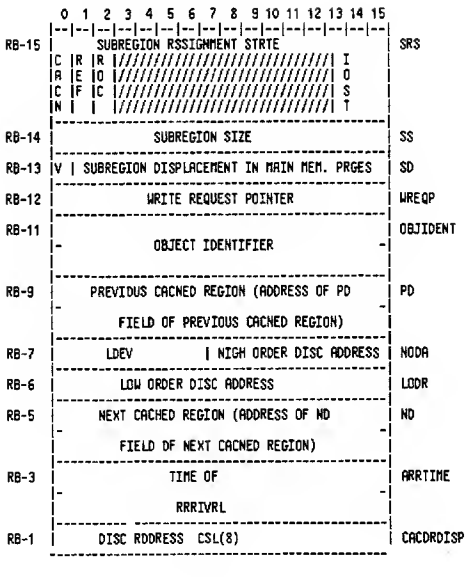





Subregion Header (Rssigned Regions)



Subregion Header (Cached Regions)








Region Header and Trailer Field Descriptions

RRS, Region Assignment State
.(0:1) Region Assigned Flag
.(1:1) Region Reserved Flag
.(2:1) Region Available Flag
.(3:1) Region Cleaned Flag
.(4:1) Size Change Pending Flag
.(5:1) Region Locked Flag
.(6:1) Region Frozen Flag
.(7:1) Region I/O Frozen Flag
.(8:1) LSTT segment, Region Map Flag
.(9:6) Not used
.(15:1) Blocked Lock Migration in Progress Flag

IOCNT, On-Going I/O Count
= # of on-going I/O's in the region which must complete before the initiation message can be processed.

INITMSG, Initiation Message
.(0:1) Message Processed Toggle Switch
.(1:1) Message Externally Disabled Flag
.(2:1) Message On-going I/O Disabled Flag
.(3:1) Queue Segment Read Disc Request Flag
.(4:1) Incore Move Request Flag
.(5:1) Expansion Request Flag
.(6:1) Garbage Collection Flag
.(7:1) Message Aborted Flag
.(8:1) Release Residual Pages Flag
.(9:1) Ok to start completion flag
.(10:5) Not used
.(15:1) Message Valid Flag

INITINFO, Initiation Message Auxiliary Information
= DRQ relative index of segment read disc request if INITMSG.QRERDREQ=1
or
= +/- Displacement to initiation message for moves and expansions.

COMPMSG, Completion Message

.(0:1) Message Processed Toggle Switch
.(1:1) Segment Modification Required
.(2:1) Block Lock Request
.(3:1) Send Scheduler R Message
.(4:1) Awaken A Device
.(5:1) Message Aborted
.(6:9) Available
.(15:1) Message Valid Flag





MPQLINK PCB relative index of the NERD of the make present queue.

PRGECNT, Release Page Count
=# of extra pages to release before processing initiation message.

SPECREQTRBPTR, A Special Request Table relative index to the list of devices queued on this segment.

SRS, Subregion Assignment State
.(0:1) Cached region
.(1:1) Referenced
.(2:1) Recover Overlay Candidate
.(13:3) I/O Status from region fetch

SS, Subregion Size

SD, Subregion Displacement
.(0:1) Displacement Count Valid Flag
.(1:15) # Pages to Base of Region

WREQP, Write Request Pointer
= DRQ Relative Index of Disc Write Request when the Data Segment in the Subregion is in Motion Out When the region belongs to a cached domain which is mapped (i. e. OBJIDENT = 30000/non zero number) this word is non zero. If the cached domain is not mapped WREQP is zero.

OBJIDENT, Object Identifier- has standard object identifier format

LKFZCNT, Lock and freeze count
.(0:8) Number of times region has been frozen
.(8:8) Number of times region has been locked

WDIDFZCNT, Iofreeze count
.(0:8) Not used
.(8:8) Number of times region has been iofrozen

For regions belonging to cached domains, the above two words contain the absolute address of the PD field in the previous region belonging to a cached domain.

NODA, High order disc address in virtual memory of this region

LODA, Low order disc address in virtual memory of this region

ND, Next cached domain link for cached domain regions only. Contains the absolute address of the ND field of the next cached region.( 2 words )





ARRTIME, Arrival time, contains the time at which the segment contained in the region became present

CRCDRDISP Valid only for regions containing a cached domain, this word represents the disc address ( in one word ) of the segment contained in the region. This word which exists in each member of a linked list of cached domains, is used as the target word during the LLSN instruction.

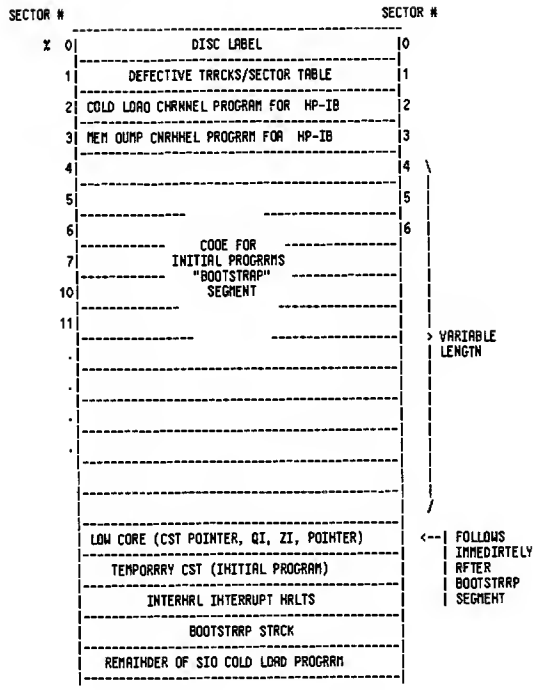
Space Allocation Structures

As of MPE V/P and V/E, one doubly linked list structure is used instead of the multiple lists ordered by size as in MPE IV. Sysglob locations %250 through %253 contain the respective head and tail (bank & address) of the available region list. These four words have in essence replaced the ARSBM and ARL data structures in MPE IV. Memory allocation and deallocation is handled through PUTONRRL and TRXEOFFRRL. The search for an available region of the desired size is done via the LLSN instruction. The format of the list is the following :

Sysglob %250 & %251 points to the absolute address of the NEXT LINK field (two words) in the first available region on the list. The NEXT LINK field in the first available region points to the absolute address of the NEXT LINK field in the second available region and so on. It is worth mentioning that in addition to having a NEXT LINK field, each available region also contains a PREVIOUS LINK pointer, which makes management of the list both easier and faster.

## CHAPTER 3 DISC LAYOUT

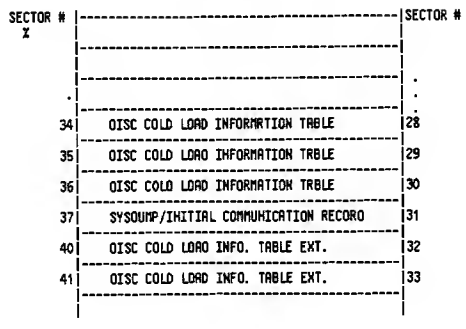
### System Disc Layout







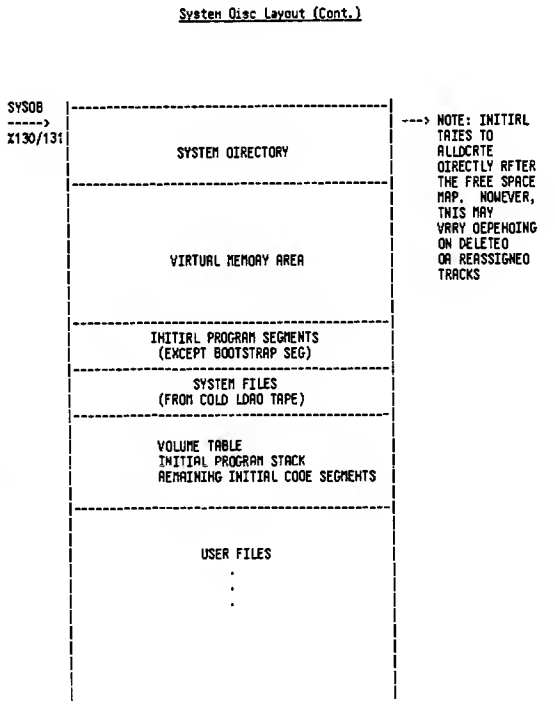

### System Disc Layout (Cont.)








### System Disc Layout (Cont.)

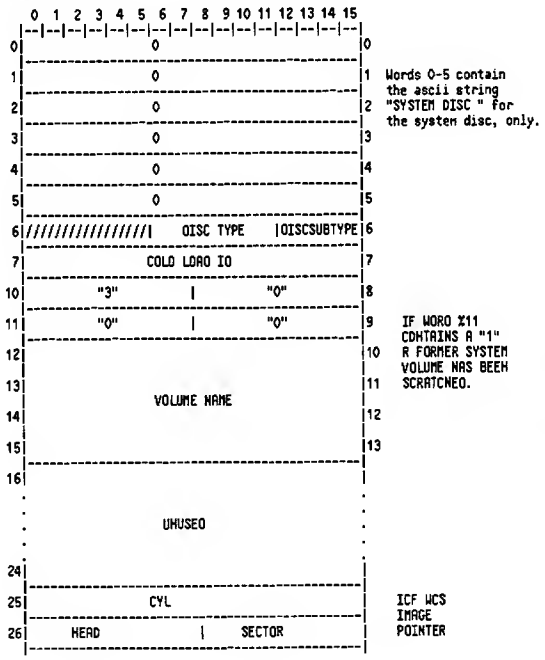




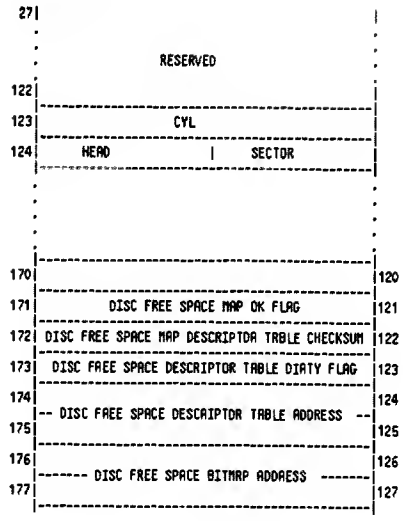



### Disc Label (Sector 0 of Disc)

System Volume



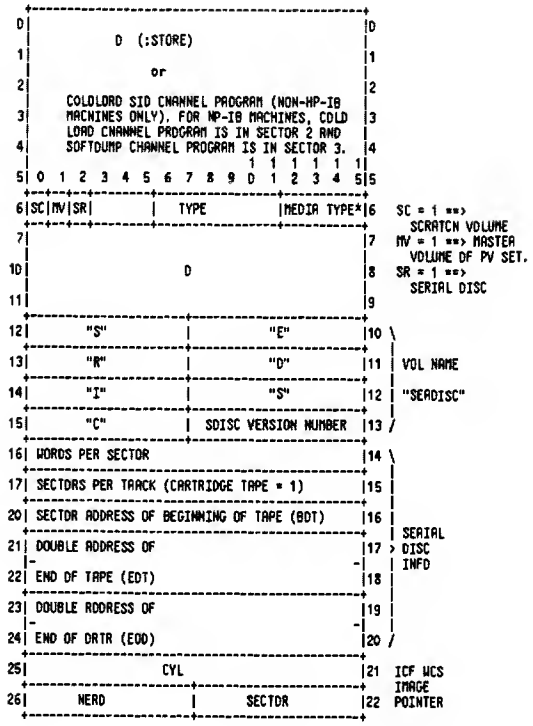
System Volume (Cont.)







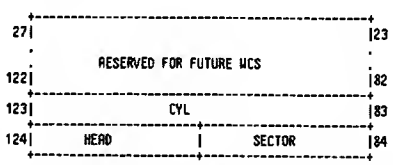

Serial Volume





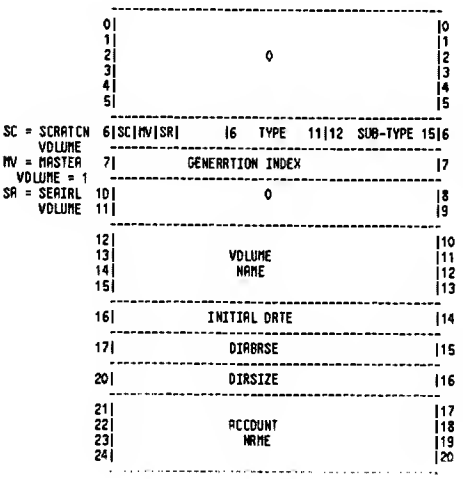



Serial Volume (Cont.)




* MEDIA TYPE is the device subtype for all serial volumes except cartridge tape. For cartridge tape, this field is always 0 (the HP 9110 subtype), despite a different actual cartridge tape subtype. This allows both forward and backward interchangeability of cartridges between the HP9110 and HP 9144.

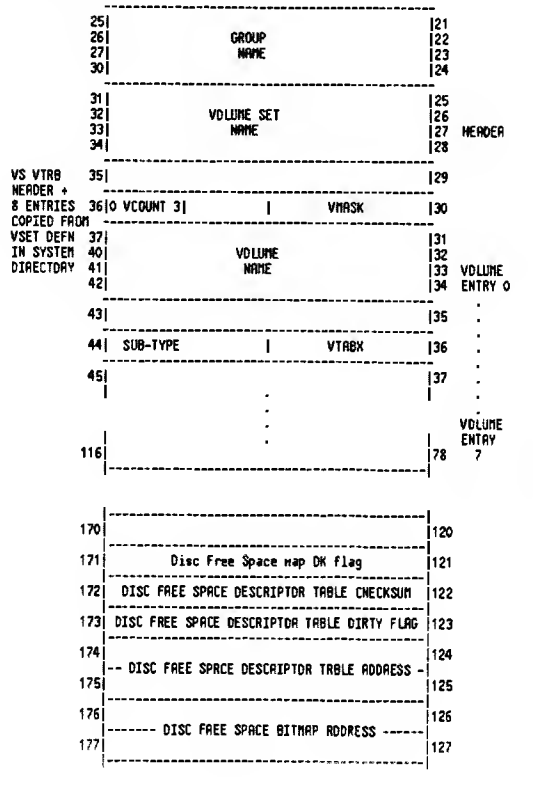
Master Volume



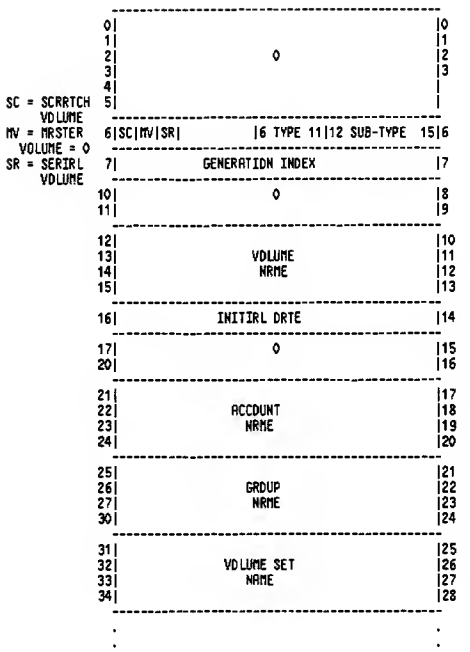





Master Volume (Cont.)



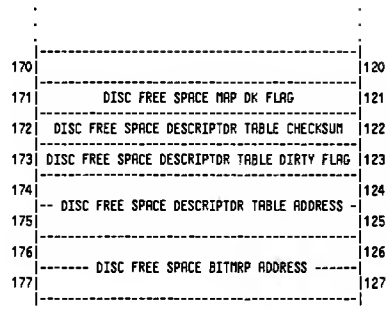
Slave Volume







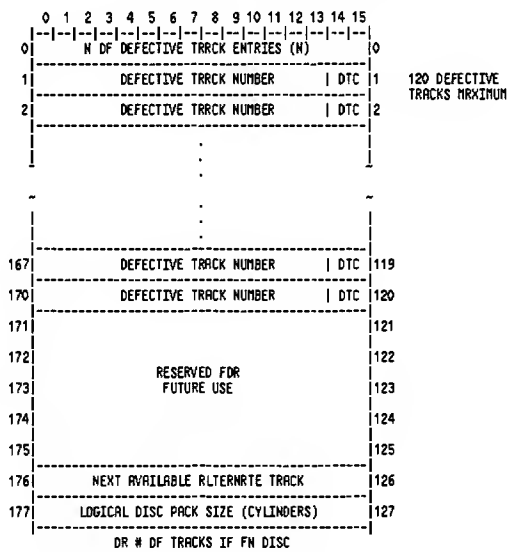

Slave Volume (Cont.)








Defective Tracks Table (Sector 1 of Disc)
(Not Used On CS-80 Discs)



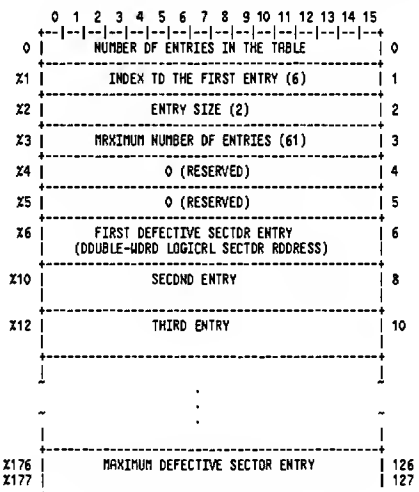

| DTC | (DEFECTIVE TRACK CODE) |
|---|---|
| 0 | suspect |
| 1 | suspect alternate |
| 2 | deleted |
| 3 | reassigned |

NDTE: The situation where there are two entries for the same track, n, one having a DTC of 0 (suspect) and the other having a DTC 3 (reassigned) results from a situation where the disc driver could not "read" (unreadable) the address of the particular track.





Defective Sector Table (DSCT -- Sector 1 of Disc)
(the DSCT exists on device type 3 (CS-80) discs, except cartridge tape)

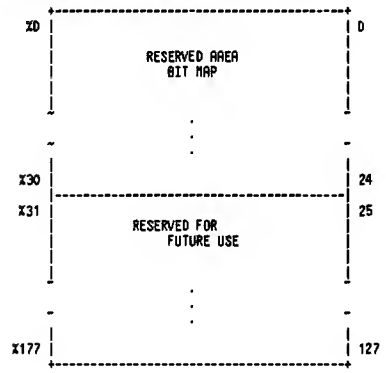



Unlike the DTT, entries in the DSCT are not permanent. Once a suspect sector is handled by INITIRL, SDISC, or VINIT, its entry is removed from the table. Thus, this table contains only unprocessed suspect sectors.

## Reserved Area Bit Map (Sector 4 of the System Disc)

The first 400 sectors of the system disc are reserved for Initial's use. This area contains permanent data structures for the boot. It is also used as a temporary storage area for data during spooling. All other system volumes and private volumes reserve only the first 10 sectors of the disc. They do not have a reserved area bit map.

The bit map contains 1 bit per sector. A '1' means the sector is free.








## Disc Cold Load Information Table (Sectors 28-30)

| | | |
|---|---|---|
| 0 | POINTER TO TABLE INFORMATION | FAEFTR >--------\| |
| 1 | POINTER TO TEMPORARY CST INFO | TCSTPTA |
| 2 | N OF ENTRIES TO AEAD ON DISC CDLO LOAD | NAEAD |
| 3 | # OF CODE SEGMENTS IN INITIAL | NVTCST' |
| 4 | INITIAL'S DB VALUE | INITDB |
| 5 | INITIAL'S DL VALUE | INITDL |
| 6 | INITIAL'S Z VALUE | INITZ |
| 7 | INITIRL'S Q VALUE | INITQ |
| 8 | INITIRL'S S VALUE | INITS |
| 9 | \| SYSDISC TYPE \| SUBTYPE | DISCTST |
| 10 | CDLO LOAD ID | CDLO'LOAD'ID' |
| 11 | LOG FILE NUMBER | LOG'FILE'NUM' |
| 12 | DIRECTORY DISC | DIAADR |
| 13 | ADDRESS | |
| 14 | LDEV 1 VIRTURL MEMORY | VIRMEMADDR |
| 15 | DISC ADDRESS | |
| 16 | N LOG PROCS | |
| 17 | LOG ID'S | |
| 18 | AIN TABLE | AINADR |
| 19 | DISC ADDAESS | |
| 20 | DIRECTORY SIZE | DIASECT |
| 21 | NSECTORS IN VIATUAL MEMORY AEGION OF LDEV 1 | SECTORS IN LDEV1VM |
| 22 | UNUSED | |
| 23 | RIN TABLE SIZE | AINSECT |
| 24 | N OF RINS | AINS |





## Disc Cold Load Information Table (Cont.)

| | | |
|---|---|---|
| 25 | N of global RINS | GRINS |
| 26 | \|TL\|AL\|AY\| | TL=Tape cold load<br>LOAD MODE<br>AL=Asload<br>RY=recovery |
| 27 | HIGHEST VOL N \| # OF VOLUMES | N'VOL' |
| 28 | DISC CDLO LOAD ENTAY POINT | DISCENTAY |
| 29 | SYSTEM DISC DRT NUMBEA | SYSDISCDAT |
| 30 | JDB MASTEA TABLE | JMATLOC |
| 31 | DISC ADDAESS | |
| 32 | IDD DISC ADDAESS | IDDLOC |
| 33 | | |
| 34 | DDD DISC ADDAESS | DDDLOC |
| 35 | | |
| 36 | WELCOME MESSAGE (DST 47 1D) | LDGONLOC1 |
| 37 | DISC ADDAESS | |
| 38 | WELCOME MESSAGE (DST 48 1D) | LDGONLOC2 |
| 39 | DISC ADDAESS | |
| 40 | LDG ID ADDAESS | |
| 41 | | |
| 42 | LDG TAB ADDAESS | |
| 43 | | |
| 44 | LDG ID SIZE | |
| 45 | LDG TAB SIZE | |





## Disc Cold Load Information Table (Cont.)

| | | |
|---|---|---|
| SIZE IN WORDS | | FAEFTA+0 <--------\| |
| MEMORY ADDRESS | *DRIVER TABLE | |
| DISC ADDRESS | | |
| SIZE IN WORDS | | FAEFTA+5 |
| MEMDAY ADDAESS | *CTABO | |
| DISC ADDAESS | | |
| SIZE IN WORDS | | FAEFTA+10 |
| MEMDRY ADDAESS | *CTAB | |
| DISC ADDAESS | | |
| SIZE IN WORDS | * COMMUNICATION SUBSYSTEM DRIVEA TABLE | FAEFTA+15 |
| MEMDAY ADDAESS | | |
| DISC ADDAESS | | |
| SIZE IN WORDS | * COMMUNICATION SUBSYSTEM DEFINITION TABLE | FAEFTR+20 |
| MEMDAY ADDAESS | | |
| DISC ADDAESS | | |

## Disc Cold Load Information Table (Cont.)

| | | |
|---|---|---|
| SIZE IN WORDS | | FAFFTA+25 |
| MEMORY ADDRESS | COMMUNICA-SUBSYSTEM TABLE | |
| DISC ADDRESS | | |
| SIZE IN WORDS | | FAFFTA+30 |
| MEMORY ADDRESS | LOGICAL-PHYSICAL DEVICE TABLE | |
| DISC ADDRESS | | |
| SIZE IN WORDS | | FAFFTA+35 |
| MEMORY ADDRESS | LOGICAL-DEVICE TABLE | |
| DISC ADDRESS | | |
| SIZE IN WORDS | | FAFFTR+40 |
| MEMORY ADDRESS | DEVICE CLASS TABLE | |
| DISC ADDRESS | | |
| SIZE IH WORDS | | FAFFTR+45 |
| MEMORY ADDRESS | VOLUME TABLE | |
| DISC ADDRESS | | |





## Disc Cold Load Information Table (Cont.)

| | | |
|---|---|---|
| SIZE IN WORDS | | FAFFTA+50 |
| MEMORY ADDRESS | LOGICAL DEVICE TABLE EXTENSION | |
| DISC ADDRESS | | |
| STACK SIZE | | FAFFTA+55 |
| MEMORY ADDRESS | INITIAL's STACK | |
| DISC ADDRESS | | |
| SIZE IN WORDS | | FAFFTR+60 |
| MEMORY ADDRESS | DEVICE CLASS TABLE HEADER | |
| DISC ADDRESS | | |
| SIZE IN WORDS | | FAFFTR+65 |
| MEMORY ADDRESS | TERMINAL DESCAIPTOR TABLE | |
| DISC ADDRESS | | |
| SEGMENT SIZE | | FAFFTA+70 |
| MEMORY ADDRESS | INITIAL/ SYSDUMP COMMUNICATION RECORD | |
| DISC ADDRESS | | |





## Disc Cold Load Information Table (Cont.)

| | | |
|---|---|---|
| SEGMENT SIZE | | FAFFTA+75 |
| MEMORY ADDRESS | DEFDATA TABLE LOOK-UP BUFFER | |
| DISC ADDRESS | | |
| | | FAFFTR+80 |
| (INITIAL'S SEGMENTS) ININ | | |

### INITIAL Program CST Map

| LOGICAL CST# | PHYSICAL CST# | SEGMENT NAME | |
|---|---|---|---|
| 0 | 1 | ININ | \ |
| 1 | 2 | BOOTSTRAP | \|----> core resident |
| 2 | 3 | RESIDENT | / |
| 3 | 4 | MAINSEG1 | \ |
| 4 | 5 | MAINSEG1A | \| |
| 5 | 6 | CONFIGURE | \| noncore resident |
| 6 | 7 | DEFCTRACKS | \| but present in core |
| 7 | 10 | SETUP | \|------\| at completion of |
| 10 | 11 | TAPEID | \| cold load |
| 11 | 12 | FILEID | \| |
| 12 | 13 | DISCSPACE | / |
| 13 | 14 | DIRECTORY1 | |
| 14 | 15 | DIRECTORY2 | |
| 15 | 16 | SL PROGRAM | |
| 16 | 17 | PROCESS | |
| 17 | 20 | MAINSEG1B | |
| 20 | 21 | MAINSEG2 | |
| 21 | 22 | MAINSEG3 | |
| 22 | 23 | MAINSEG4 | |

*code segment swapping starts at completion of MAINSEG1





## SYSDUMP/Initial Communication Record (Sector 31)

| | | |
|---|---|---|
| 0 | MIT VERSION | |
| 1 | MIT UPDATE | |
| 2 | MIT FIX | |
| 3 | VERSION | |
| 4 | UPDATE | |
| 5 | FIX | |
| 6 | EXP SYSTEM NR. | |
| 7 | HIGHEST DAT | |
| 10 | HIGHEST LDEV | |
| 11 | HIGHEST VDL/# OF VDLS | |
| 12 | # OF ADD'L DRIVERS | |
| 13 | COLD LOAD COUNT | |
| 14 | FILES DUMPED | F=(13:1)Set if FOS Sysdump |
| 15 | SERIAL DISC LOAD (F\|D\|S) | D=(14:1)Set if Future date Sysdump |
| 16 | TAPE RECORD SIZE | S=(15:1)Set if serial disc Sysdump |
| 17 | DISC COLD LOAD ENTRY | |
| 20 | MAX INITIAL SEG SIZE | |
| 21 | SPARE | |
| 22 | SPARE | |
| 23 | SPARE | |
| 24 | DEV CLASS TAB SIZE | |
| | TERM DESCRIPTOR SIZE | |
| | OLD VTAB SIZE | |
| | OLD INFO SIZE | |
| | CS TABLE SIZE | |

SYSDUMP/Initial Communication Record (Cont.)

| | | | |
|---|---|---|---|
| 25 | TABLE LOOKUP BUF SIZE | | |
| 26 | TABLE LOOKUP BUF ENTRIES | | |
| 27 | SYSTEM TAPE LDEV # | | |
| 28 | SPARE | | |
| 29 | SPARE | | |
| 30 | CONVERSION BITS WORD 1 | M | M = (15:1) MPE Version |
| 31 | CONVERSION BITS WORD 2 | D | D = MPE (G.00.00) |
| 32 | CONVERSION BITS WORD 3 | | 1 = MPE (G.01.00) |
| 33 | CONVERSION BITS WORD 4 | | |
| 34 | SPARE | | |
| 35 | SPARE | | |
| 36 | SPARE | | |
| 37 | SPARE | | |
| 38 | SPARE | | |
| 39 | SPARE | | |
| 40 | LOG FILE NUMBER | | |





Cold Load Information Table Extension

The Cold Load Information Table Extension is a part of the Cold Load Information Table that has no use in booting the system. It exists for different system level processes to hold information that would only be created during a RELOAD. A good example of this is the system log file number. This is only created on a RELOAD, and changed whenever a log file is full or a boot (other than a RELOAD) is performed.

In order to protect the Cold Load Info Table, the extension was created. In this way NO I/Os should be performed to the Cold Load Information Table during MPE operation. However to process data into the Cold Load Info Extension a process must use the access routine "PROCESS'COLD'LOAD'INFO". The exact calling sequence can be found in KERNEL0.

The Cold Load Information Extension is 2 sectors long and immediately follows the SYSDUMP/Initial Communication Record starting at sector address N31 on logical device 1.

The assigned entries are as follows:

| | |
|---|---|
| | 0 |
| RESERVED FOR FUTURE SYSTEM USE | 2 |
| | 20 |
| SYSTEM LOGGING FILE NUMBER | 21 |
| NETWORK MANAGEMENT LOGGING FILE NUMBER | 22 |
| NETWORK MANAGEMENT TRACE FILE NUMBER | 23 |
| FULL/PARTIAL COMMAND DUMP DATE | 24 |
| | 25 |
| | 26 |
| NOT CURRENTLY ASSIGNED | 27 |
| | 28 |
| | 255 |





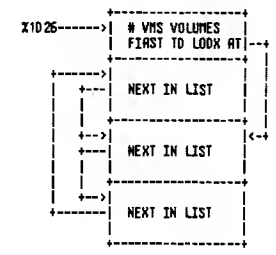
Virtual Disc Space Management Structures

Disc space for data segments is allocated from reserved regions of system volumes which have been assigned the virtual memory supporting (VMS) attribute. The data structure used for accounting and management of the virtual disc space of the various VMS volumes is the Virtual Disc Space Table (VDSMTAB). This structure consists of a circular list of entries, one for each VMS volume. Each entry contains the information defining the state of the virtual memory region on that volume.

Virtual Disc Space Management Table

VDSMTAB DSTN = 39 (X47)
VDSMTABPTR = Absolute(X1026) = SYSGLOB X26

General Structure





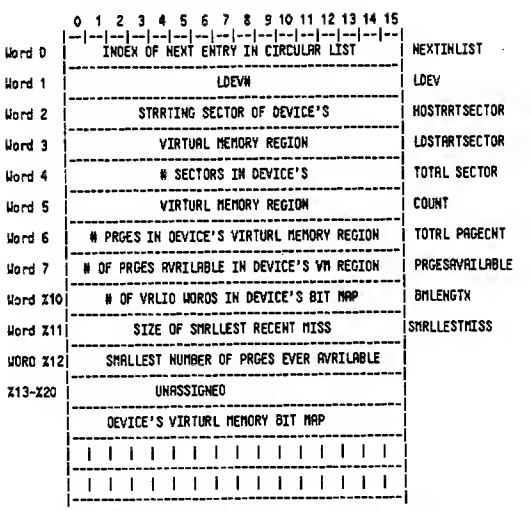



VDSMTAB Entry D Format

| | D 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | |
|---|---|---|
| VDSMTAB00 | #WORDS IN VDSMT | TABLELENGTH |
| VDSMTAB01 | # SYSTEM VOLUMES WHICH HAVE VIRTUAL MEMORY | VMSVOLUMECNT |
| VDSMTAB02 | INDEX OF NEXT ENTRY TO ALLOCATE FROM | STARTENTRY |
| VDSMTAB03 | VM PAGE SIZE (512) | VMPAGESIZE |
| VDSMTAB04 | N SECTORS/VM PAGE (4) | SECTORSPERVMPAGE |
| VDSMTAB05 | OFFSET FROM ENTRY TO BITMAP (X20) | OFFSETTOBM |
| VDSMTAB06 | TOTAL N VM PAGES CONFIGURED IN SYSTEM | |
| VDSMTAB07 | LEAST N OF VM PAGES THAT HAVE EVER BEEN AVAIL. | |

VDSMTAB X1D-X17 UNASSIGNED

VDSMTRB General Entry Format



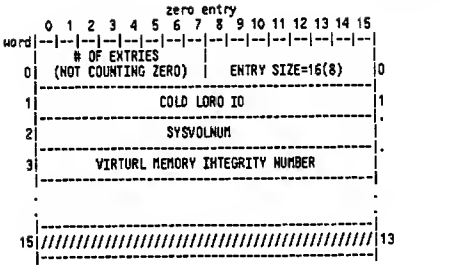

***COMMENT: R bit on in a device's VMBIT MAP
==> Corresponding VM page is free.





Volume Table

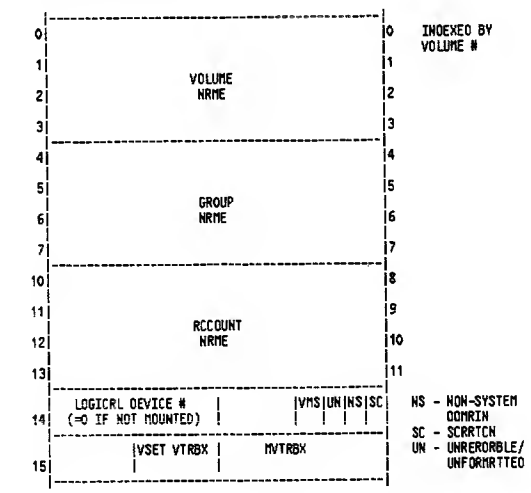
SIR #22=X26
OST #29=X35







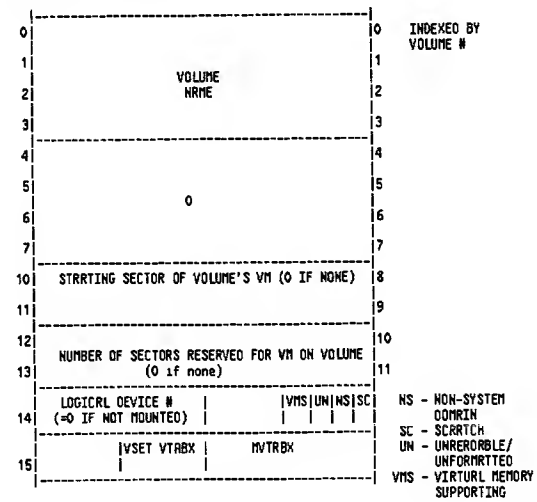

Typical Private Volume Entry








Typical System Volume Entry



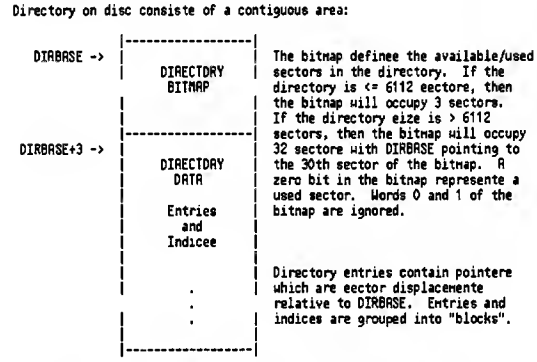
# CHAPTER 4 DIRECTORY

## Introduction to the Directory

SYSGLOB cells:

DIRBASE <----absolute disc addr of base [SYSGLOB+X'30 RND X'31]

Directory on disc consists of a contiguous area:




The capacities for accounts/groups/users/files are dependent on their block sizes.

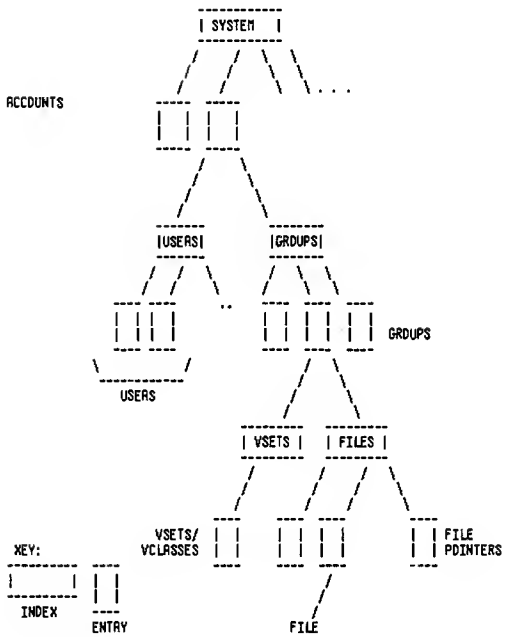
| | | |
|---|---|---|
| * | SYSSAIBSIZE | System acct index block size (3 sectors) |
| | SYSAUIBSIZE | Acct. user index block size (1-3 sectors) |
| | SYSAGIBSIZE | Acct. group index block size (1-3 sectors) |
| | SYSGFIBSIZE | Group file index block size (2 sectors) |
| | SYSGVSIBSIZE | Group volume set definition ind. blk. size(1 sector) |
| * | SYSAEBSIZE | Acct. entry block size (3 sectors) |
| | SYSUEBSIZE | User entry block size (2 sectors) |
| | SYSGEBSIZE | Group entry block size (2 sectors) |
| | SYSFEBSIZE | File entry block size (2 sectors) |
| | SYSVSEBSIZE | Volume set definition entry block size (1 sector) |
| | SYSMAXBSIZE | Maximum of above. (used to initialize DDS.) |

*These values are used once for the creation of the (root) system, account index or new systems. This root index is always at address DIRBASE+3.





## Overview of Directory

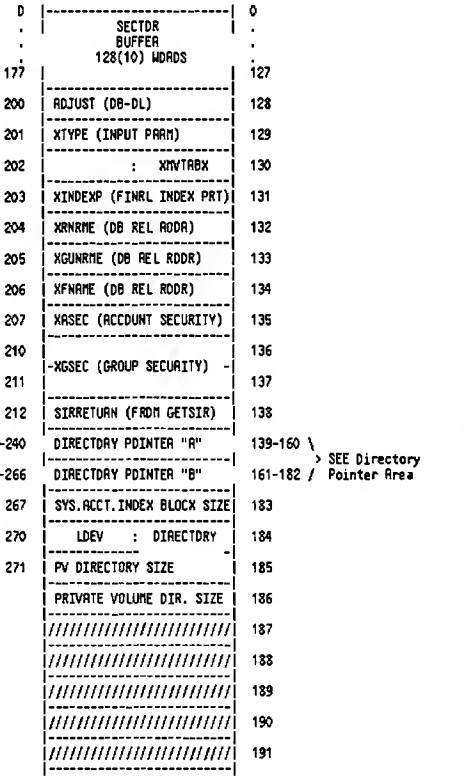



Overview of Directory





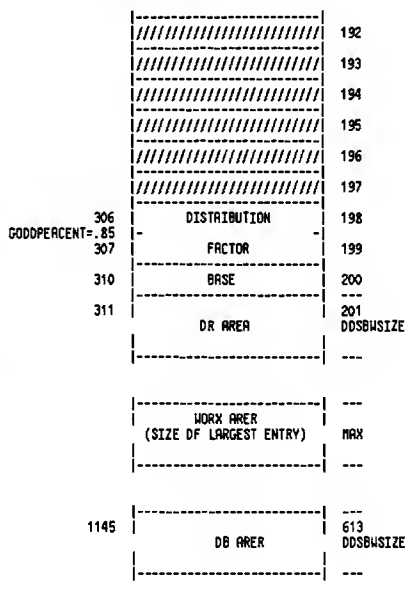
## Directory Data Segment








## Directory Data Segment (Cont.)



Directory Pointer Area [DA or DB] DST=20(10) SIR=8(10)

```
^ |-------------------------------|
| |   LDEV      | DIRECTORY BASE  | 139/161 DIRBASE1'
| |-------------------------------|
| |  ADDRESS OF PAGE IN BUFFER    | 140/152 DIRBASE2'
| |-------------------------------|
| | DIRECTORY PAGE IN BUFFER      | 141/163 CONTENTS
| |-------------------------------|
| | DB ADDRESS OF 1ST ELEMENT     | 142/164 LPNTR
| |-------------------------------|
| | STARTING ADDRESS OF BUFFER    | 143/155 IOPNTR
| |-------------------------------|
| | # VALID PAGES IN BUFFER       | 144/166 NUMVALID
| |-------------------------------|
| | D|                         |8 | 145/167 D=DIRTY FLAG, 8=BRD ELEMENT
| |-------------------------------|
| | ELEMENT SIZE                  | 146/168 XSIZE      NOTE:
|**|-------------------------------|
| | # WORDS USED IN BLOCK         | 147/169 USED    **  INDEXES AND
| |-------------------------------|                     ENTRIES
| | BLOCK SIZE (SECTORS)          | 148/170 BSIIE
| |-------------------------------|                   *  INDEXES ONLY
| | BLOCK SIZE (WORDS)            | 149/171 BWSIZE
| |-------------------------------|
| | MAX # ELEMENTS/BLOCK          | 150/172 BFRCTDR
| |-|-|-|-|----------|-----------|
| |I|P| TY|ELEMENT SIZE|BLOCK SIIE| 151/173 MISCWD
| | | |   |   (WORDS)  | (SECTORS)|
| |-|-|-|-|----------|-----------|
| | NUMBER OF ELEMENTS            | 152/174 XCOUNT
| |-------------------------------|
| | NUMBER OF RCCESSORS           | 153/175 PCOUNT
| |-|-|-|-|----------|-----------|
| | ENTRY TDTRL                   | 154/176 ETOTRL
| |-|-|-|-|----------|-----------|
| |0|P| TY|ENTRY SIZE| BLOCK SIZE| 155/177 EMISCWD
| |-|-|-|-|  (WORDS) | (SECTORS) |
| |-|-|-|-|----------|-----------|
| | FRTHER INDEN POINTER          | 156/178 PINDEXP
| |-------------------------------|
| |  F          |                 | 157/179
|*|----R--------|-----------------|
| |     T       |   N             | 158/180 PNAME   TY = 0-FILE
| |-------H-----|-----R-----------|                       1-GRDUP
| |        E    |     M           | 159/181               2-RCCT
| |-----------R-|---------E-------|                       3-USER
| |             |                 | 160/182               4-VSD
v |-------------|-----------------|                 I  = 0-ENTRY BLOCK
                                                        1-INDEX BLOCK
                                                    P  = PURGE FLAG
```





Directory Space Data Segment (DIRSDS)

DST=21 (X25)

SIR=8
10

DST = 21 ( X25 )

```
                                  1 1 1 1 1 1
  0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
 |===============|===============|
0| Logical device|    Bit map    |
 |---------------|               |
1|      base sector address      | DS'BASE
 |-------------------------------|
2| Ptr to last avail word in buff| DS'LAST'WORD
 |-------------------------------|
3|  Ptr to first word in buffer  | DS'FIRST'WORD
 |-------------------------------|
4|  Size in sectors of directory | DS'DIR'SIZE
 |-------------------------------|
5|D|E|S|P|                       | DS'FLAGS
 |-------------------------------|
6|  First current sector in buff | DS'CUR'SECTOR
 |-------------------------------|
7|  Disc address of current part |
 |                               | DS'RDDR
10|    of bit map in the buffer  |
 |-------------------------------|
11|    Size of buffer in words    | DS'SIIE
 |-------------------------------|
12|     Next requested sector     | DS'REQ'SECTOR
 |-------------------------------|
13|     Last sector in bit map    | DS'LAST'SECTOR
 |-------------------------------|
14|  System saved pntr to last    | DS'SYS'LAST
 |-------------------------------|
15|  System saved pntr to first   | DS'SYS'FIRST
 |-------------------------------|
16|  System saved current sector  | DS'SYS'CUR
 |-------------------------------|
17|     Saved directory size      | DS'SYS'SIIE
 |-------------------------------|
20| LDEV that last error occurred | DS'ERROR'LDEV
 |-------------------------------|
21|  Type of error that occurred  | DS'ERROR'TYPE
 |-------------------------------|
```





```
        |                               |
        |  This section of the bit map  |
        |  DST is occupied by up to 3   |
        |  sectors of bit map.  It is   |
        |  swapped in 3 sectors at a    |
        |  time as needed. DS'FIRST'WORD|
        |  is updated to search for     |
        |  space in the bit map.  When  |
        |  it reaches DS'LAST'WORD for  |
        |  the second pass, the next 3  |
        |  sectors of bit map will be   |
        |  swapped in.                  |
        |                               |
        |===============================|
```

Partial definitions:

```
DS'LDEV        =  DS'BASE0.(0:8)
DS'DIRTY       =  DS'FLAGS.(0:1)
DS'ERR'IN'PROG =  DS'FLAGS.(1:1)
DS'DIR'DISABLED=  DS'FLAGS.(2:1)
DS'PERM'DISABLE=  DS'FLAGS.(3:1)
```

Descriptions:

DS'ADDR

This is the address of the section of bit map that is currently in the buffers. For example, this address will usually be the same as DS'BASE. If we need to page in more sectors of bit map than the first three, then this address will be subsequently larger than DS'BASE.

DS'BASE

This is the base address of the directory bit map. If the directory is greater than 6112 sectors, then this address will be 29 sectors less than the address found in the Cold Load Information table on disc.

DS'CUR'SECTOR

This is the current bit map sector number of the first sector in the buffer area. Its value can range from 1 to 30. This number minus one added to DS'BASE will result in DS'RDDR.

DS'DIR'DISABLED

If this bit is on, the directory allocation and deallocation is off and only a WARMSTART will turn this bit off. The bit is turned on if an I/O error occurs on a directory bit map sector or if we find data integrity problems with the bit map, i.e. if we attempt to deallocate a sector that is already deallocated.





DS'DIR'SIZE

This is the size (sectors) of the directory area. This size includes only the last 3 sectors of the bit map. If the directory is greater than 6112 sectors, then this size does not include the extra 29 sectors of bit map. It can also be thought of as the number of bits in the bit map.

DS'DIRTY

This bit is set if the bit map sectors in the buffer have been modified in any way. When more sectors must be brought into the buffers, or if we switch to a different domain (system to PV, PV to system) this bit is interrogated to determine if the sectors presently in the buffers must be first written to disc.

DS'ERROR'LDEV

The LDEV in which the last directory error occurred.

DS'ERROR'TYPE

This word describes the type of directory bit map error that occurred. Its legal values are:

0 - No error
1 - I/O error on a write
2 - I/O error on a read
3 - Attempting to deallocate space that is already deallocated
4 - Directory space management is already disabled

DS'ERR'IN'PROGRESS

A directory space management error is currently in progress.

DS'FIRST'WORD

A DST relative pointer to the word in the bit map buffer that we will interrogate next when directory space is needed. When the system first comes up, this word is always initialized to DS'HEADER+2 (i.e. to point to the first word in the bit map). On subsequent bit map sector reads, it is set to DS'HEADER since subsequent sectors will not have the 2 word overhead that exists in the first sector of the bit map.

DS'FLAGS

This word contains numerous flags. See individual descriptions.

DS'LAST'SECTOR

This is the total number of active bit map sectors. This number will range from 1 to 32.

DS'LAST'WORD

This is the current number of bit map word in the buffer. It can range from 1 to %577 + DS'HEADER. If there exists 3 full sectors in the buffer, then it will have the value %600 + DS'HEADER - 1 or %621. It is compared to DS'FIRST'WORD to determine if we have hit the end of the current buffer area.

DS'PERM'DISRBLE

If this bit is set, then directory allocation/deallocating is permanently disabled. This bit should not be set.

DS'REQ'SECTOR

This is the next sector to begin reading in up to 3 bit map sectors. It is updated by 2 or 3 and the read procedure will bring in up to 3 sectors starting from this sector. If this sector is set to be greater than DS'LAST'SECTOR, then it is reset to 1. After the sectors are read in, DS'CUR'SECTOR is set the DS'REQ'SECTOR.

DS'SIZE

This is the size in words of the bit map buffer area. It is always a multiple of a sector (128 words). It will usually have the value of %600. Legal values are %200, %400 and %600.

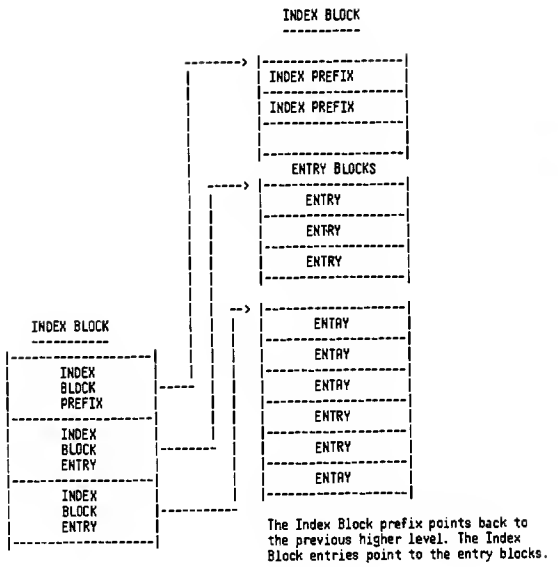
DS'SYS'LAST, DS'SYS'FIRST, DS'SYS'CUR & DS'SYS'SIZE

The values of DS'LAST'WORD, DS'FIRST'WORD, DS'CUR'SECTOR and DS'SIZE will be stored in these locations when the directory space management switches from the system directory to a private volume directory. And, of course, when DSM switches back to system domain, the above mentioned values are reinitialized with these values.





Directory Structure




The Index Block prefix points back to the previous higher level. The Index Block entries point to the entry blocks.

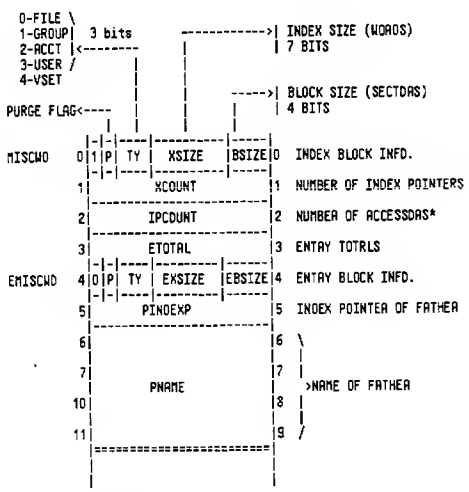




Directory Definitions

>PAGE - smallest allocatable record ("phys.recd")-currently sector.
>BLOCK - integral# of pages; contains contiguous indices or entries.
>INDEX - pointer to entry block, containing name of 1st entry.
>ENTRY - information-containing "object" May contain pointer to an index block.
>POINTER - 15-bit positive relative page number (relative to directory base).
>DOS - directory data segment.
>ELEMENT - a generic name for index or entry.

Index Block Prefix (10 Words)

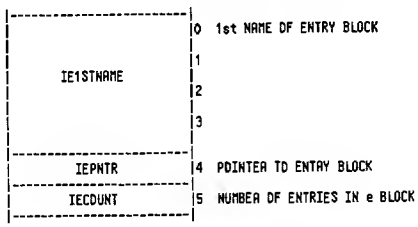



*The count is incremented by each access that uses and relies upon a pointer to the index block, i.e., it is guaranteed not to be purged while the count is not = 0.

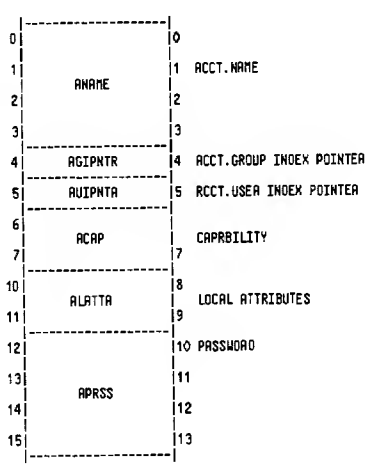




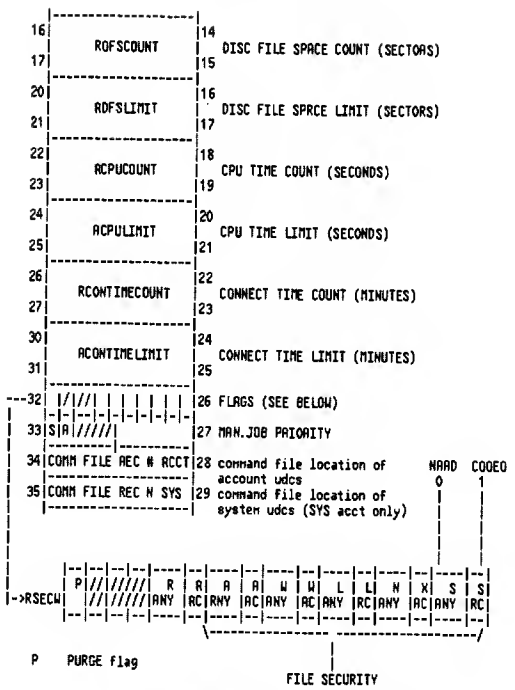
Index Entry (6 Words)




Rccount Entry (%36 Words)



## Account Entry (Cont.)



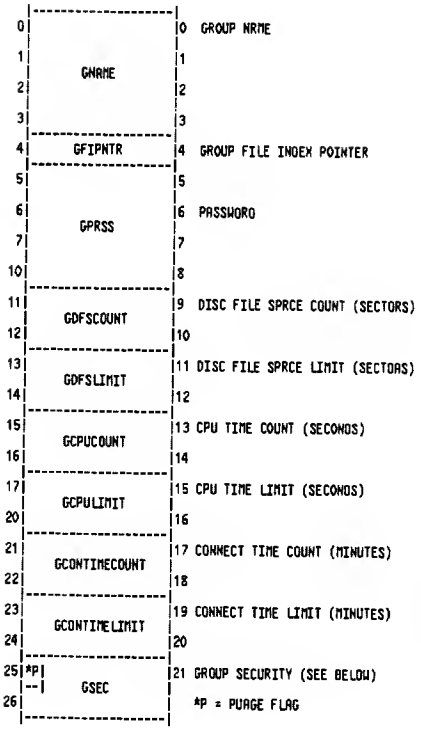

P PURGE flag

S If 1, system level UDC's exist (only in "SYS" account)
R If 1, account level UDC's exist for account





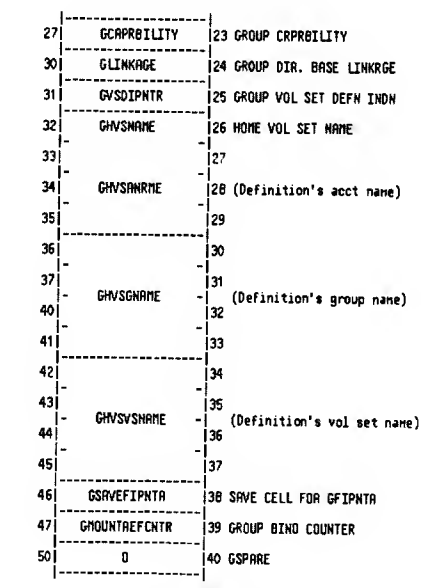
## Group Entry (X51 Words)



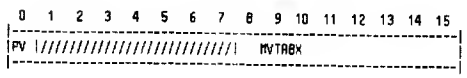





## Group Entry (Cont.)




GLINKAGE



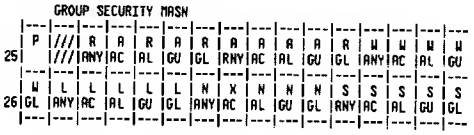




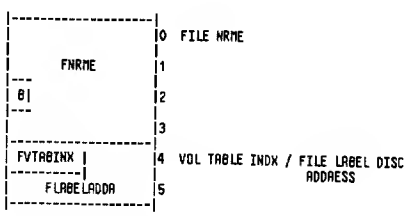

## Group Entry (Cont.)

GLINKAGE (0:1) = 0; MVS is in System Domain
(0:1) = 1; MVS is in Private Volume Domain
(8:8) = 0; If not PV or Not Bound
(8:8) <>0; If PV and Bound

GROUP SECURITY MASK

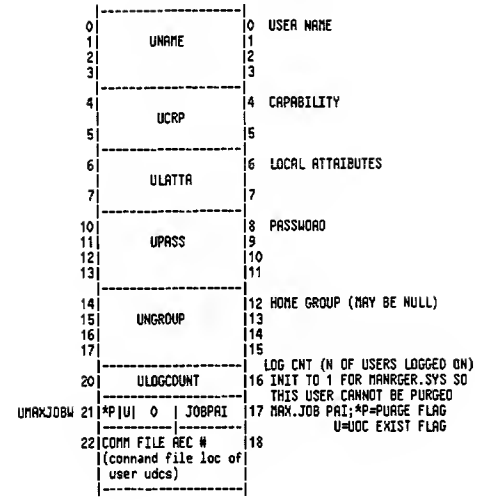



## File Entry (File Pointer)(6 Words)




8 - Bad file label
(0:1) = 0 - not defective
= 1 - defective

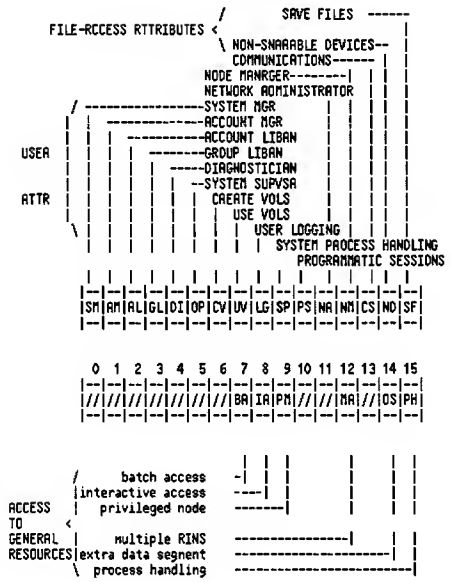
## User Entry (19 Words)







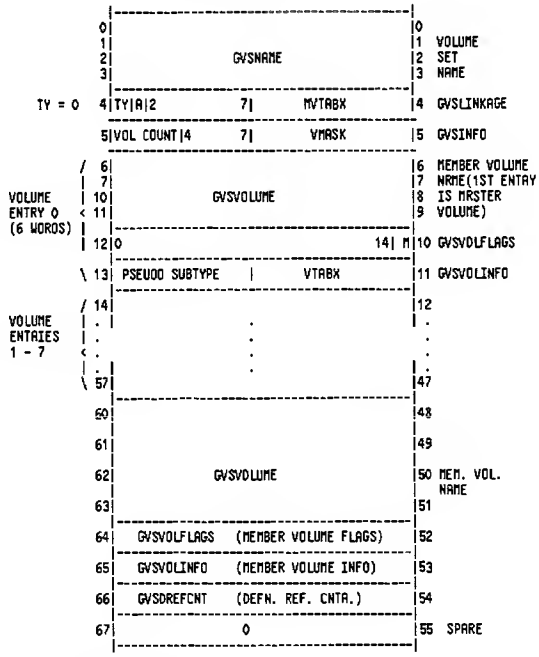

## User Attributes/Capability








## Volume Set Definition Entry




TY = 0 VOLUME SET DEFINITION
= 1 VOLUME CLASS
MVTABX: MOUNTED VOLUME TABLE INDEX (IF MOUNTED)
VOL COUNT: NO. OF VOLUMES
VMASK: VOLUME MASK
M = 0 NOT MOUNTED
= 1 MOUNTED
VTABX: VOLUME TABLE INDEX

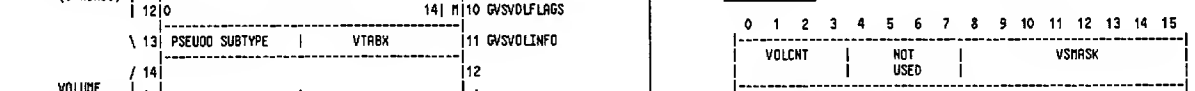




### G V S L I N K R G E


T - TYPE
0 = Volume Set Definition
1 = Volume Set Class
R - ALLOCATING FLAG
0 = not initially allocating (not 1st user of set)
1 = 1st user of set allocating resources (transitional)
MVTABX - Mounted Volume Table Index
0 if volume set not logically mounted

### G V S I N F O




VOLCNT - Number of members in set
VSMASK - Bit mask of volume member usage
Order is from right to left
i.e., bit 15 is 1st member, bit 14 is 2nd member ...

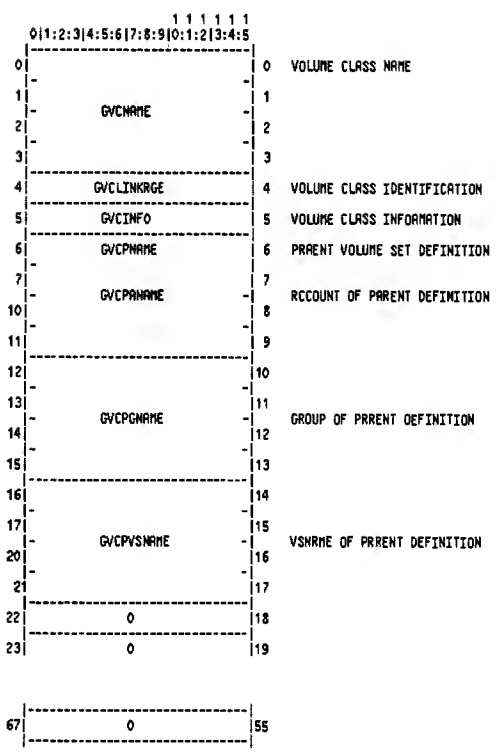
### G V S V O L F L A G S


M - Member Mounted Flag
0 = not mounted
1 = mounted

### G V S V O L I N F O


DISC PSEUDO-SUBTYPE = (Actual type *16) + actual subtype.
VTABX - Volume Table Index

## Volume Set Class Entry








## G V C L I N K A G E

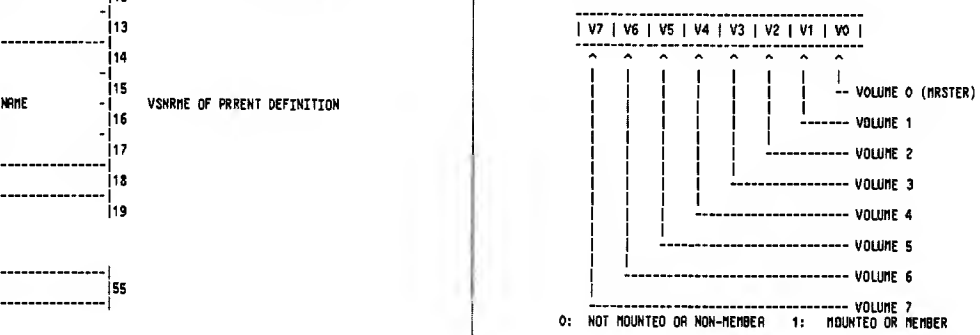

T - TYPE
1 = Volume Set Definition
0 = Volume Set Class

## G V C I N F O


VOLCNT - Number of members in set
VCMRSK - Bit mask of volume member usage (VOLUME CLASS MASK)
Order is from right to left
i.e. bit 15 is 1st member, bit 14 is 2nd member ...

### Volume Mask Format

- USEO IN MVTAB, PVUSER, FILE CONTROL BLOCK (FCB), VOLUME SET/CLASS DEFINITION, VOLUME SET VTAB.
- 8-BIT MRSK.




0: NOT MOUNTEO OR NON-MEMBER 1: MOUNTEO OR MEMBER

## CHAPTER 5 LOCK RESOURCES

### SIR# Allocation OCT 253

Sir's Ordered by Sir Number

| SIR # | RANK | SIR NAME |
|---|---|---|
| 1 | 10 | LOAD PROCESS |
| 2 | 335 | CACHE CONTROL |
| 3 | 91 | IOD |
| 4 | 92 | ODD |
| 5 | 50 | PROCESS TREE STRUCTURE |
| 6 | 60 | SCHEDULING QUEUE |
| 7 | 70 | CST ENTRIES |
| 8 | 80 | SYSTEM DIRECTORY |
| 9 | 90 | LPDT |
| 10 | 85 | LDT |
| 11 | 110 | STORAGE IN OVERLAY AREA |
| 13 | 130 | JPCNT |
| 14 | 140 | JCUT |
| 15 | 27 | JMAT |
| 16 | 5 | FMAVT |
| 17 | 22 | LOADER SEGMENT TABLE |
| 18 | 180 | VOD |
| 19 | 190 | SPOOL |
| 20 | 200 | MESSAGE CNTRLOGUE |
| 21 | 210 | RIT |
| 22 | 220 | VOLUME TABLE |
| 23 | 230 | WELCOME MESSAGE SIR |
| 24 | 240 | ASSOCIATION TABLE |
| 25 | 250 | CS RLLOCATE |
| 26 | 260 | LOGGING BUFFER |
| 27 | 83 | PV MVTAB |
| 28 | 280 | MESSIR |
| 29 | 290 | PV USER TABLE |
| 30 | 300 | IMAGE |
| 31 | 310 | KSAM |
| 32 | 320 | USER LOGGING |
| 33 | 330 | DEBUG BREAKPOINT TABLE |
| 34 | 340 | PCB |
| 35 | 350 | SUB-QUEUE MAPPING TABLE |
| 36 | 360 | CILOG |
| 37 | 25 | FILE INTEGRITY |
| 38 | 380 | RIN |
| 39 | 390 | TAPE LABELS |
| 40 | 87 | DEVICE CLASS TABLE |
| 41 | 400 | Reserved |
| 42 | 401 | Cold Load SIR |
| 43 | | 1st JOB |
| 44 | | 2nd JOB |
| . | . | . |
| . | . | . |





Sir's Ordered by Ranking

| RANK | SIR # | SIR NAME |
|---|---|---|
| 5 | 16 | FMAVT |
| 10 | 1 | LOAD PROCESS |
| 22 | 17 | LOADER SEGMENT TABLE |
| 25 | 37 | FILE INTEGRITY |
| 27 | 15 | JMAT |
| 50 | 5 | PROCESS TREE STRUCTURE |
| 60 | 6 | SCHEDULING QUEUE |
| 70 | 7 | CST ENTRIES |
| 80 | 8 | SYSTEM DIRECTORY |
| 83 | 27 | PV MVTAB |
| 85 | 10 | LDT |
| 87 | 40 | DEVICE CLASS TABLE |
| 90 | 9 | LPDT |
| 91 | 3 | IOD |
| 92 | 4 | ODD |
| 110 | 11 | STORAGE IN OVERLAY AREA |
| 130 | 13 | JPCNT |
| 140 | 14 | JCUT |
| 180 | 18 | VOD |
| 190 | 19 | SPOOK |
| 200 | 20 | MESSAGE CNTRLOG |
| 210 | 21 | RIT |
| 220 | 22 | VOLUME TABLE |
| 230 | 23 | WELCOME MESSAGE |
| 240 | 24 | ASSOCIATION TABLE |
| 250 | 25 | CS RLLOCATE |
| 260 | 26 | LOGGING BUFFER |
| 280 | 28 | MESSIR |
| 290 | 29 | PV USER TABLE |
| 300 | 30 | IMAGE |
| 310 | 31 | KSAM |
| 320 | 32 | USER LOGGING |
| 330 | 33 | DEBUG BREAKPOINT TABLE |
| 335 | 2 | CACHE CONTROL |
| 340 | 34 | PCB |
| 350 | 35 | SUB-QUEUE MAPPING TABLE |
| 360 | 36 | CILOG |
| 380 | 38 | RIN |
| 390 | 39 | TAPE LABELS |
| 400 | 41 | Reserved |





### SIR Table Information

The system internal resource table is located in non-linked memory (resident table). The SIR table is used to protect critical system elements against access by more than one process, i.e., it provides a "lock out" mechanism. Each critical system resource (usually a table) is assigned a specific SIR number. Procedures are provided within MPE to lock (GETSIR) and unlock (RELSIR) the SIR. Processes attempting to obtain a SIR that is not available are impeded by the system. The SIR table entries form the head of a linked list in this case. If more than one process becomes impeded, word 15 of the PCB entry is used to add the "new" process to the growing list. The method of unimpeding the process depends on the SIR type.

R SIR does not respect process priority and operates in a FIFO manner. When a process is added to the end of the queue, the priority of the holder of the SIR and the priority of all intervening processes are increased. They are increased to the priority of the newly requesting process.

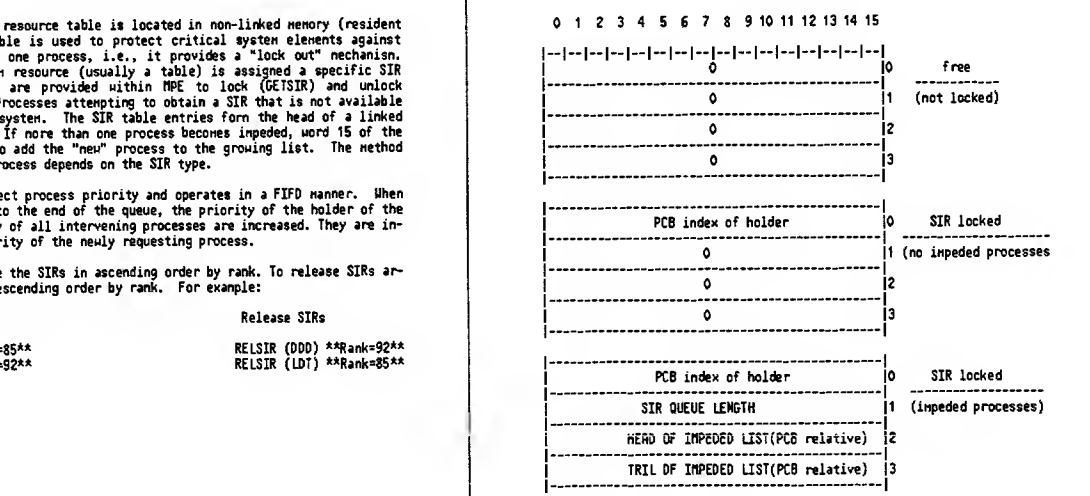
To get SIRs, arrange the SIRs in ascending order by rank. To release SIRs arrange the SIRs in descending order by rank. For example:

| Get SIRs | Release SIRs |
|---|---|
| GETSIR (LOT) **Rank=85** | RELSIR (DDD) **Rank=92** |
| GETSIR (DDD) **Rank=92** | RELSIR (LDT) **Rank=85** |





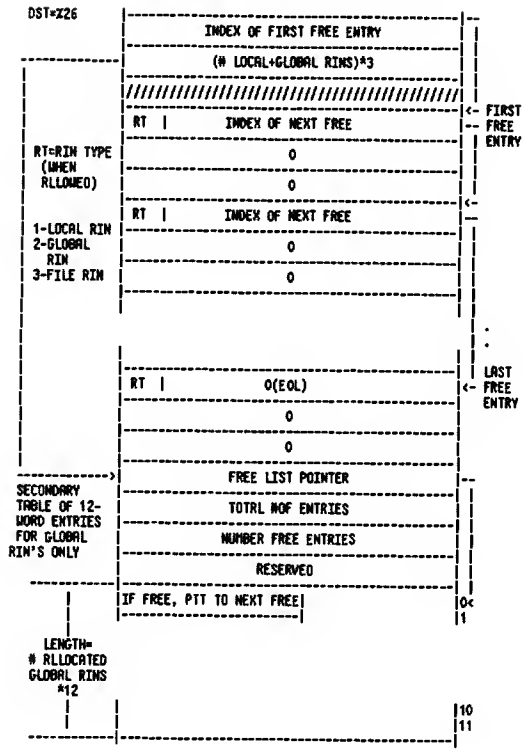
### SIR Entry Formats




P = PIN#
PIN = PCB table entry number
SIR QUEUE LENGTH- number of processes queued for this SIR

The SIR table is indexed by SIR#, with each SIR# corresponding to a unique, pre-assigned system internal resource. Entry #0 is not used. Impeded lists are established by using the SIR table entry (2) as the head of the list and PCB(15) for elements. PINs are always used as pointers, with 0 indicating end of list.

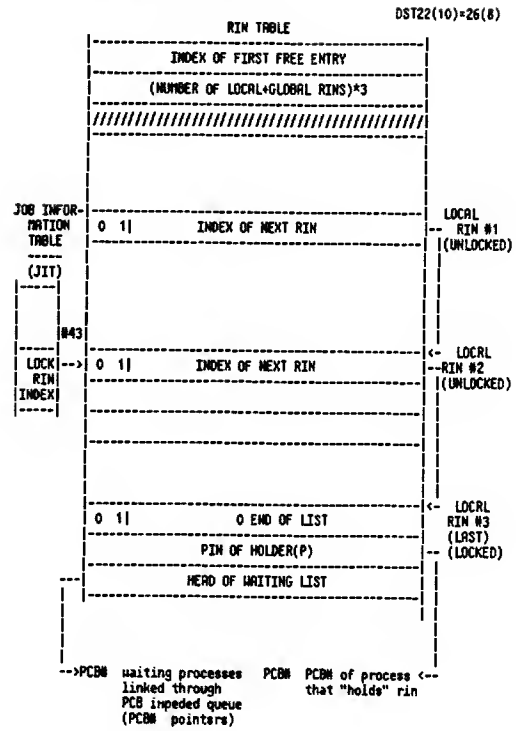
RIN Table General Layout (Initialized State)








Allocation and Locking of Local RINS

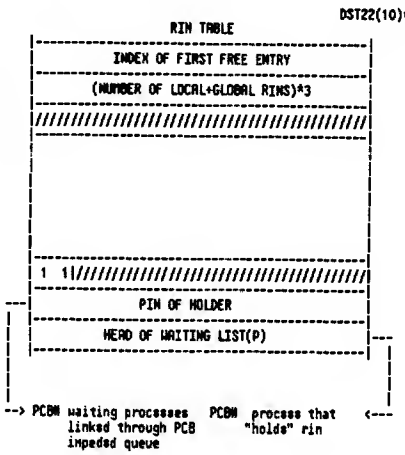



P = PIN#





Allocation and Locking of File RINS

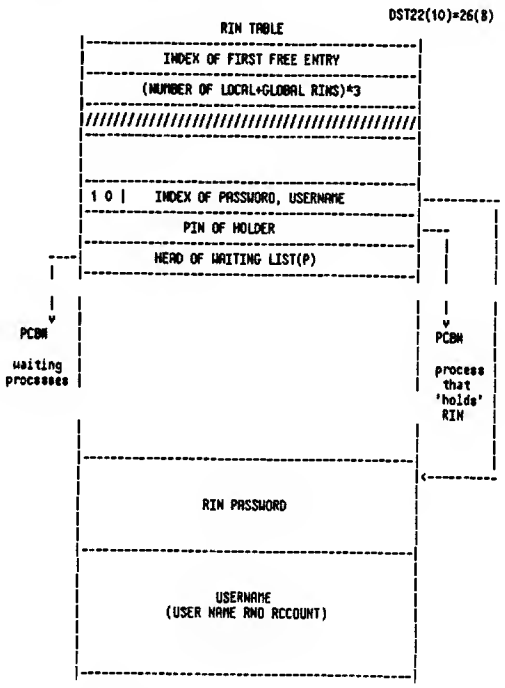



P=pin#





Allocation and Locking of Global RINS




P=pin#

INDEX OF PASSWORD = RELATIVE TO BASE OF SECONDARY TABLE

# CHAPTER 6 FILE SYSTEM

This chapter describes the MPE V file system. The second section describes the basic concepts. The third section describes the table structures used.

## File System Overview

I/O to files is done by reference to file numbers, which are assigned by calling the FOPEN intrinsic. This establishes an initial "point of attachment", which may be described as a connection between a program (i.e., process) and that particular point in a particular file at which the next FREAD or FWRITE would cause data to be transferred. A point of attachment is described by a control block, of which there are several different kinds (described later). Control blocks may exist in the process's own stack or in an extra data segment assigned by the file system. In order to find control blocks quickly, a pointer scheme called vectors is used. A control block is uniquely described by a vector, which consists of two words with the first word containing a segment number and the second word containing a word offset into the control table of the vector table entry which describes the location of the control block within that segment. The entire assemblage, consisting of eight overhead words, the vector table, and all of the control blocks to which it points, comprises the entire segment; if in a stack, it occupies part of the PXFILE part of the PCBX.

The point of attachment is described by a "physical access control block", or PACB, which will exist as a result of an FOPEN to any file (except $NULL). Any required I/O buffers are associated with the PACB; refer to Section 2.1.

All FOPENs specifying "multi-access" for all processes running under a single job use a single PACB for references to a multi-access file. Although all these are attached to a single point in the file, the type of attachment (i.e., ROPTIONS) may be different. So, each FOPEN specifying a multi-access file establishes a "logical access control block", or LACB, which contains the point-of-attachment local values. The use of a single buffer (i.e., PACB) ensures that references by various processes or against various FOPENs within one process are dealt with in strict sequential order. Note that references to a file by other jobs, or by other processes not specifying multi-access, will be through other PACBs, whose buffers will be read or written at the pleasure of the file system; in order to ensure any sort of coherence to such shared references, the jobs must use global RINS and FLOCK and FUNLOCK the file. $STDIN, $STDLIST, and spoolfiles are opened multi-access automatically.

In the case of disc files, there is another kind of control block: the file control block (FCB). It contains copies of information read from the file label, such as the end-of-file pointer, the extent map, and the record and block structure. The EOF pointer is updated in the FCB as the file is written, and all changes made to the FCB are posted to the file label when the file is closed. An FCB is shared by all jobs in the system which reference the file.





The file number assigned by an FOPEN is an index into the Available File Table (AFT), a table of six-word entries which is at the end of the PXFILE part of the PCBX. Two double words are vectors to the PACB and (if it exists) the LACB.

AFT entries can also reside in a global AFT extra data segment. If the file was opened Global AFT (specified in the AOPTIONS) and the program is privileged, then the AFT is placed into this global AFT DST. Any accesses to the file are identical to local AFT's. All accesses to the file opened global must be done from privilege mode code. The file system intrinsics distinguish this file by a negative file number. Again, these files are identical in every other way except for where the AFT entry resides.

Because control blocks are shared among processes, it is necessary to have a scheme for coordinating access to them. A control block is "locked" by a process which requires exclusive access to it for a time. Other processes which attempt to lock the block will find it already locked, and will be impeded and queued. It may also be necessary to lock an entire control block table so that a process can create or destroy a control block in it, or lock or unlock an existing control block in the table.

Another table used by FOPEN is the File Multi-Access Vector Table (FMAVT). This table exists in a system extra data segment and is used by all jobs and processes in the system. When a file is being FOPENed with multi-access specified, the FMAVT is searched; if the file is already open, the FMAVT gives the PACB vector for the prior reference for each job.

## Buffers

A bit in AOPTIONS specifies, when a file is opened, whether access is to be buffered or unbuffered. If unbuffered, data is transferred directly between the I/O device and the user's buffer (usually in his stack), which will be frozen in memory for the duration of the transfer. If buffered, the data is moved between the user's buffer and a file system buffer to which the I/O is actually done.

Buffers are associated with the PACB, attached to it as an appendage.





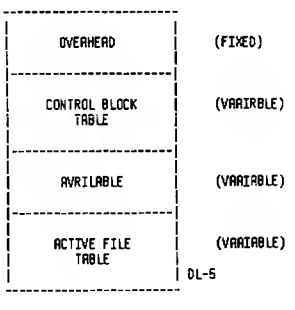
## Table Formats

This section gives a detailed discussion of the main tables constructed and used by the file system. The location and overall structure of each table is given, in addition to the table format and a discussion of each field in the table. Table indices at the right of the table are in octal. Index names apply to the entire word; if in parentheses, the names are defined in the file system listing but not explicitly used there.

## File System Section of PCBX (PXFILE)

The PXFILE area is a subsection of the PCBX. It is a contiguous, expandable and contractible block of storage that is managed by the file system primarily for its own use. Other subsystems, namely CS and DS, also make use of the PXFILE section. In doing so they must conform to the conventions of the file system.

The overall structure of the PXFILE area is:








## Overhead

The part labeled Overhead contains information that pertains to the entire section. It is addressed via the pointer at DL-3.

| 0 1 | 7 8 | 15 | | |
|---|---|---|---|---|
| PXFILE SIZE IN WORDS | | | 0 | PXFSIZE |
| LAST DOPEN ERROR NO. | LAST COPEN ERROR NO. | | 1 | |
| N | | | 2 | |
| LAST DS RFT | | | 3 | |
| SLAVE AFT NUMBER | | | 4 | |
| LAST XOPEN ERROR NUMBER | LAST FOPEN ERROR NUMBER | | 5 | |
| AFT SIZE IN WORDS | | | 6 | PXAFTSIZE |
| CS TRACE FILE INFO | | | 7<br>8 | (PXCTRINFO) |
| LAST RESPONDING NO-WAIT I/O AFT ENTRY NUMBER | | | 9 | PXFLEFTOFF |
| 1ST USER (NOBUF) CONTROL BLOCK TABLE DST NUMBER | | | 10 | PXFCBT1 |
| 2ND USER (NOBUF) CONTROL BLOCK TABLE DST NUMBER | | | 11 | (PXFCBT2) |
| 3RD USER (NOBUF) CONTROL BLOCK TABLE DST NUMBER | | | 12 | (PXFCBT3) |
| 4TH USER (NOBUF) CONTROL BLOCK TABLE DST NUMBER | | | 13 | (PXFCBT4) |
| 5TH USER (NOBUF) CONTROL BLOCK TABLE DST NUMBER | | | 14 | (PXFCBT5) |
| 6TH USER (NOBUF) CONTROL BLOCK TABLE DST NUMBER | | | 15 | (PXFCBT6) |
| 7TH USER (NOBUF) CONTROL BLOCK TABLE DST NUMBER | | | 16 | (PXFCBT7) |
| 8TH USER (NOBUF) CONTROL BLOCK TABLE DST NUMBER | | | 17 | (PXFCBT8) |

Partial word field identifiers are:

```
PXFDOPEN    = PXFILE(1).(0:8)N,   last DOPEN error code
PXFCOPEN    = PXFILE(1).(8:8)N,   last COPEN error code
PXFNOCB     = PXFILE(2).(0:1)N,   no CB's in PXFILE CBT?
PXFXOPEN    = PXFILE(5).(0:8)N,   last XOPEN error code
PXFFOPEN    = PXFILE(5).(8:8)N,   last FOPEN error code
```

Discussion:

| | |
|---|---|
| PXFAFTSIZE | This is the size (in words) of the Active File Table (AFT). The size is in words to simplify calculating the size of the available block. |
| PXFCBT1-8 | These are the DST numbers of the user (NOBUF) control block tables. A DST number of 0 indicates that no data segment is allocated. |
| PXFCOPEN | This contains the last COPEN error number. Not used by the file system. |
| PXFCTRINFO | This contains information pertinent to the CS trace file. Not used by the file system. |
| PXFDOPEN | This contains the last DOPEN error number. Not used by the file system. |
| PXFDSINFO | Reserved for DS. Not used by the file system. |
| PXFFOPEN | This contains the last FOPEN error number. If it is zero then the last FOPEN successfully completed; otherwise the last FOPEN was unsuccessful and the number is the file system error number. |
| PXFKOPEN | This contains the last KOPEN error number. KSAM is partly embedded in the file system, and an FOPEN failure on a KSAM file can be caused by a failure to open either the key file or the data file. This error number is used in conjunction with PXFFOPEN to determine which file caused the KSAM open failure. This error number is not used by the file system. |
| PXFLEFTOFF | This is the AFT entry number of the last file/line that completed a nowait I/O; if zero then no nowait I/O has been completed. This cell is maintained solely by and for the IOWAIT intrinsic. |
| PXFNOCB | This bit signifies that control blocks are not to be created in the PXFILE control block table. This bit is set by the NOCB parameter to the CREATE intrinsic or the :RUN command. This feature permits the user to have as much stack space as possible; otherwise the file system will take several hundred words of stack for the PXFILE control block table. |
| PXFSIZE | This is the size (in words) of the complete PXFILE area. It is the sum of the overhead block, the control block table, the active file table and the available block. |





PXFILE Control Block Table (PXFCBT)

Addressing within a PXFILE control block table is somewhat more complicated than addressing an extra data segment CBT since the table does not begin at DB+0. As a result all pointers within the table are table relative; the starting address of the table must be added to a pointer to generate a final DB-relative address. This addressing convention is consistently applied to all control block tables.

When the control block table is expanded, space is taken from the AVAILABLE area. If no space is available then the PXFILE area is expanded and the acquired space is added to the AVAILABLE area.

Available Block

The part labeled Available is used to provide space when the Control Block Table or the Active File Table is expanded. These two tables grow towards each other, and when more space is needed it is simply taken from the Available Block.

When the Available area is exhausted, the PXFILE area is expanded, the AFT is relocated and the new space is added to the Available Block.

Currently the PXFILE area is only expanded; it is never contracted.

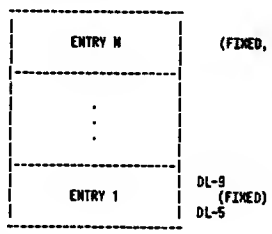




Active File Table (AFT)

The part labeled Active File Table contains information used by the file system (or CS, DS, etc.) to grossly characterize the file access and, most importantly, to give the location of the control blocks.

The overall structure of the AFT is:

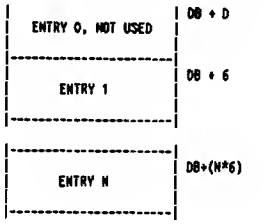



where N = PXFAFTSIZE/6.

The length of the AFT is specified by PXFAFTSIZE. Unused entries are all zeros. When the table is full it is expanded by taking space from the Available block.

The AFT is negatively indexed by file number: the entry at DL-9 corresponds to file number 1, the entry at DL-15 corresponds to file number 2, etc.

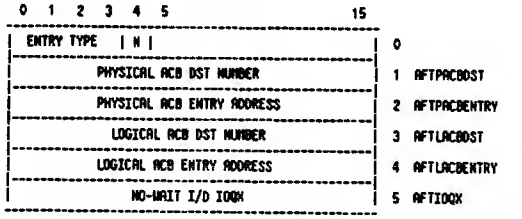
The structure of the global AFT DST, described in Section 2 is as follows:








The structure of a file system AFT entry is:




The entry format depends on the entry type; the file system uses entry type 0.

The following partial word field identifiers are used:

```
AFTTYPE     = AFT.(0:4)#,    entry type
AFTNULL     = AFT.(4:1)#,    $NULL file
```

Discussion:

| | |
|---|---|
| AFTIOQX | This is the IOQ index of the pending nowait I/O (if any). This is applicable if the file was opened with the NOWAIT option specified. Also, CS and DS have the same capability and use this cell in a consistent manner. This is because the IOWAIT intrinsic services the file system as well as CS and DS, and is the principal user of this call. If the IOQX is negative, then one of two possibilities exist. If the file is a message file, then file IOQX is the accessor's reply port. If the file is a standard MPE file, then a read was done to a nonexistent extent and this is simply a stub inserted by the file system. |
| AFTLACBDST | This is the DST that the Logical ACB (LACB) if it exists. This is applicable if the file was opened with the multi-access option specified. |
| AFTLACBENTRY | This is the word offset into the control block table of the LACB vector table entry, applicable if the file was opened with the multi-access option specified. |
| AFTNULL | This bit signifies that the file is $NULL and that there are no control blocks. |

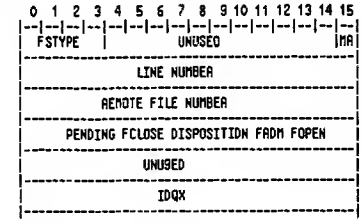
AFTPACBDST — This is the DST that contains the Physical ACB (PACB). A PACB exiete for all filee except $NULL.

AFTPACBENTRY — This ie the uord offeet into the control block table of the PACB vector table entry. Thie will be nonzero for all files excpt $NULL.

AFTTYPE — This is the AFT entry type number. At present the following entry types are defined:

0 - file system
1 - remote file
2 - DS (nouait I/O diealloued)
3 - OS (nouait I/O allowed)
4 - CS
5 - CS
6 - KSAM
8 - Meseage File

Remote file AFT entry:

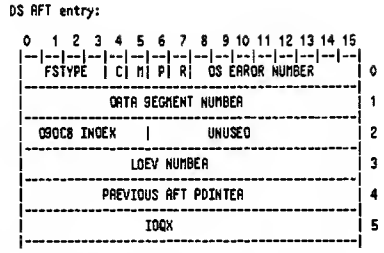



AFT 0
FSTYPE - This value will be 1 for remote filee.
MA - Set if the file was opened multi-acceee.
AFT 1 - Local line number of remote file.
AFT 2 - File number of the remote file.
AFT 3 - Pending disposition of the file. Set when file was FOPEN'd and will possibly be used as the FCLOSE disposition.
AFT 5 - No wait I/O Queue Index.





DS AFT entry:

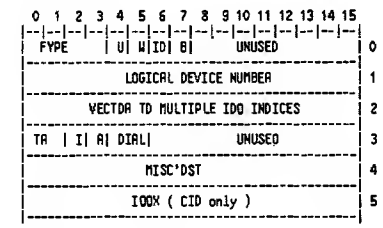



AFT 0
FSTYPE - Thie field uill have the value 2 or 3.
C - On if DSOPEN called by CXOSLINE or REMOTE'HELLO.
M - On if Master PTOP AFT.
P - On if PTOP related.
R - On if remote main procees.
AFT 1 - DS data segment table pointer.
AFT 2 - OSDSCB Index - OS data segment control block index.
AFT 3 - Logical device number.
AFT 4 - Preceding OS open AFT Pointer.
AFT 5 - IOQX - Same as described above.





CS Line entry:




AFT 0
FTYPE - This value will be 4 or 5. A 5 signifies that the line has an autodialer attached.
W - The line has been opened with no uaiting on I/O requests.
ID - Line ie a multipoint control or 3270 station.
B - Line was opened uith buffering.
AFT 1 - Logical device number of the line.
AFT 2 - Vector to Multiple IOQ indices.
AFT 3
TR - Bit 0 on signifies tracing enabled. Bit 1 on signifies trace all.
I - On if line is currently connected.
A - Signifies that this CS device is an SCCP device.
DIAL - 0 = Dial on urite, answer on read.
1 = Answer on urite, dial on read.
2 = Always dial.
3 = Never dial.
AFT 4 - OST number of the line's misc data segment.
AFT 5 - If <> 0, then it is the system OB address of a eingle request IOQ entry. IOWAIT uses this word to pass the IOQ index of the completed request for this AFT to CSIOWAIT.

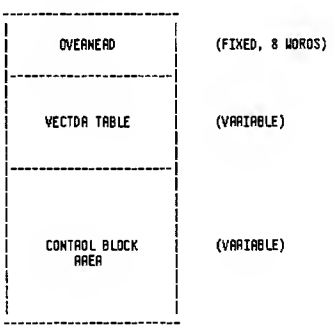




File Control Block Table (CBTAB)

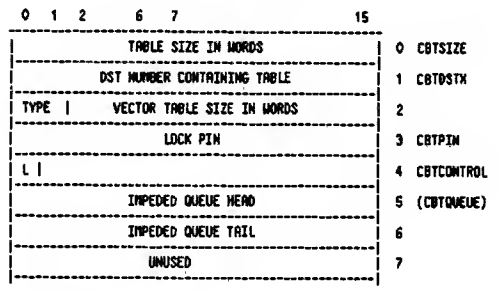
A file control block table can be located in two places: (a) as a subpart of the PXFILE area, as discussed in Section 3.1.2; or (b) in a data segment. Although putting control block tables in PXFILE has the advantage of providing rapid access, it detracts from the space for the user's etack; so the larger control blocks (or optionally, all control blocks) are put into extra data segments. On the other hand, referencing extra data segments may result in an absence trap, uhich is slow. Extra data segment control block tables are of three kinds: expandable, nonexpandable, and shared FCB. Nonexpandable CBT's are used for a eingle PACB with buffers, i.e., uhere the control block is large or uhere the control block can't be local to a single process (for multi-access). Expandable (or NDBUF) CBT's are used for small control blocks ,as LACB's, PACB's uith no buffers, and FCB's uhich are local to a single process. A list of the expandable CBT's associated with a process is kept in the overhead area of PXFILE (cf. Section 3.1.1). When a small control block is needed, these CBT's are checked in order to see if one of them has room. Shared FCB CBT's are similar to expandable CBT's except that they belong to the system rather than to a eingle process; the system keeps a list of OST's uhich it has assigned for this purpoee.

The overall structure of a control block table is:



Overhead

The part labeled Overhead contains information pertaining to the entire table.




Other identifiers used:

```
CBTTYPE   = CBTAB(2).(0:2)   Control block table type
CBTVTSIZE = CBTAB(2).(2:14)  Vector table size
CBTLOCKBIT= CBTCONTROL.(0:1) Lock bit
```

Discussion:

CBTDSTX — This is the DST number of the data segment that contains the control block table. If the table is contained in a stack, i.e. in the PXFILE area, then this is the DST number of the stack and not 0.

CBTLOCKBIT — If the entire control block table is locked, then this bit is set. No locking count is kept since control blocks are locked only once from FCREATECB and FDELETECB when control blocks are added to and deleted from the table. The procedure LOCK'CB does not lock the control block because it runs PSEUDODISABLED during the critical times.

CBTQUEUE — This is the impeded queue for the table and has the same format as the impeded queue for a control block in the table. There is no second impeded queue because that facility is used exclusively for BREAK requests against the PACB for $STDIN/$STDLIST.





CBTPIN — This is the PIN number of the process that has the control block locked.

CBTSIZE — This is the size in words of the table. It is initialized when the table is created and changed when the table is expanded. At present a table is never contracted, even though this is possible.

CBTTYPE — This field is the type of the control block table. Possible values are:

0 - Stack [PXFILE]
1 - NOBUF (expandable)
2 - System shared FCB
3 - Buffered (Contains a single PACB)

CBTVTSIZE — This is the size, in words, of the vector table area in the control block table. It does not reflect the number of entries used or unused.

NOTE: All PIN's are kept as the word offset into the PCB table and as the actual PIN number.

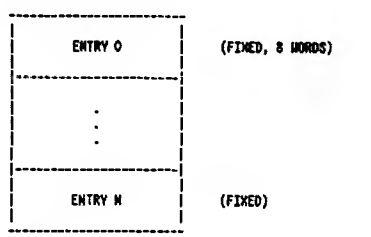




Vector Table

The part labeled Vector Table contains information used to locate and lock or unlock control blocks in the control block table.

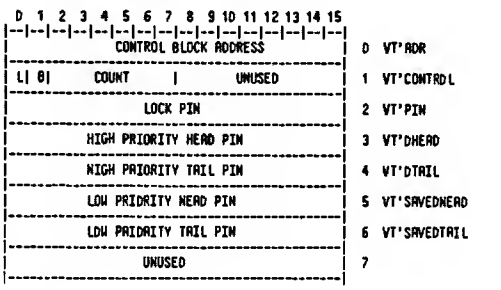
The overall structure of the vector table is:




where N = (CBTVTSIZE/8)-1.

An unused vector table entry will have zeros in all the words of the entry. A used vector table entry will have a nonzero value in the first word of the entry (the control block address is necessarily nonzero).

The general structure of a vector table entry is:








The following partial word identifiers are used:

```
VT'LOCK'BIT  = VT'CONTROL.(0:1)
VT'BREAK'BIT = VT'CONTROL.(1:1)
VT'COUNT     = VT'CONTROL.(2:6)
```

Discussion:

VT'ADR — Control block address is the table relative address of the control block associated with the vector table entry. It is a word displacement from the beginning of the control block table.

VT'BREAK'BIT — This bit signifies that we are in the middle of break mode. This is used for the PACB of $STDIN/$STDLIST from a terminal session only.

VT'LOCK'BIT — This bit is set whenever the control block is locked.

VT'COUNT — This is the count of the number of times that the control block has been locked by the process identified in VT'PIN. If it is zero, then the control block is not locked.

VT'PIN — Contains the PIN of the process which has exclusive access to the control block. Other processes attempting to access the block will be impeded and queued.

VT'QUEUE — The high priority impeded queue is a double word of PINs that are the head and tail of the impeded queue of processes waiting for access to the control block. Processes are impeded and unimpeded by the file system using the normal mechanisms available under MPE.

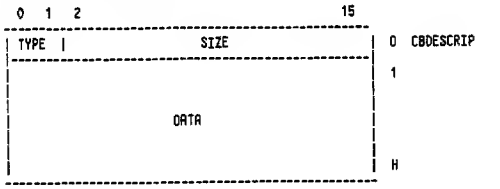
VT'SAVEDQUEUE — The low priority impeded queue is a double word of PINs and has the same format as VTQUEUE. This only time this word is used is when the control block is in BREAK mode, which can only happen to an ACB corresponding to $STDIN/$STDLIST. It is used to save the current VT'QUEUE when the control block goes into BREAK mode and to restore VT'QUEUE when the control block goes back into non-BREAK mode.

NOTE: All PIN's are stored as offsets within the PCB table and not as actual PIN numbers.

Control Block Area

The part labeled CONTROL BLOCK AREA containe the control blocks ueed by the file syeten.

To Facilitate storage nanagenent, all control blocke have the sane overall structure:




where N = Size-1.

Partial word field identifiers are:

```
CBTYPE      = CB.(0:2)#,     control block type number.
CBSIZE      = CB.(2:14)#;    control block size
```

Discussion:

CBDESCRIP — This is the firet word oF a control block; the format is connon for all control blocks.

CBSIZE — This is the size (in words) of the control block. The size includes the descriptor word.

CBTYPE — This is the type number of the control block. There are four types of control blocks:

0 - Garbage 1 - FCB 2 - PRCB 3 - LACB

When a control block table is created the initial control block area is completely allocated to a single control block of type garbage. When space is requested for a new control block the control block area is scanned (using a first fit algorithn) for a garbage control block that is as large as the size requested. The space for the new control block is taken from this garbage control block and the space remaining becomes the new garbage control block size.





When epace is returned it becones a new garbage control block. To reduce fragnentation the nsw garbage control block is combined with either of ths two neighboring control blocke if they are of type garbage.

If epace ie requeetad and no garbage control block ie large enough to contain the new control block then ths control block area and control block table are expanded by a sufficient anount. If expaneion ie not possible, sone other control block table nust be used.

Accese Control Block (ACB)

Virtually every file systen intrinsic conetructs an ACB as its First action. When using the nulti-access option, each acceseor sharee a eingle PACB. However each accessor is permitted to view the shared File in a slightly different nannsr than the other accessors. For example, one accessor nay accese the file in a read-only node while the other accessore nay acceee the file in a read-write node. To do thie, each accessor nust, during his accees, have a slightly different ACB.

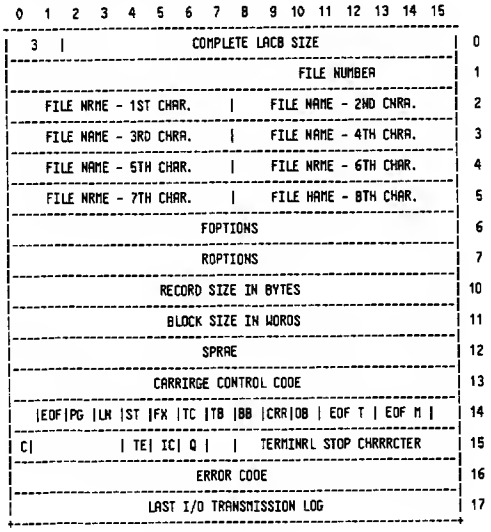
The PACB holds information that is global to all acceeeore of the file. The LACB holds information that is local to each accessor of the File. Rt the beginning of a particular acceee, an ACB is conetructed by calling LOC'ACB, which copies information From both the LACB and ths PACB. At the end of the accass, the ACB ie releassd by calling UHLOC'ACB; thie updatee the PACB and LACB fron the ACB since sons of ths fields nay have been nodifisd due to the access. This echene nearly slininatss EXCHANGEOB's to accese the variove data ssgnents.





Logical Rccess Control Block (LACB)

All LACBs have the sane structure:




Partial word Field identifiers are:

```
LACBSIZE       = LACB.(2:14)#,   size in words
LACBSTOPCHAR   = LACB(2).(0:8)#, terminal stop character
```

Discussion:

LACBAOPTIONS — See ACBAOPTIONS.

LACBBSIZE — See ACBBSIZE.





LACBCTL — See ACBCTL.

LACBERROR — See RCBERROR.

LACBFNUM — See ACBFNUM.

LACBFOPTIONS — See RCBFOPTIONS.

LACBMODE — See RCBMODE.

LACBNAME1-8 — See RCBNAME.

LACBPACB — This is the OST and vector table entry for the Physical ACB (PACB) for the file. file.

LACBRSIZE — See ACBRSIZE.

LACBSIZE — This is the size, in words, of the LACB. All LACBs are eighteen (decimal) words long.

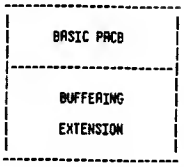
LACBSTATE — See RCBLSTATE.

LACBSTOPCHAR — See ACBSTOPCHAR.

LACBTLOG — See RCBTLOG.

Physical Access Control Block (PACB)

The overall structure of the PACB is:




The buffering extension is optional; it is present if and only if the file is accessed with buffering. There are thus two possible formats for an ACB:

1. No buffers; the buffering extension is not present.
2. PACB buffers; the buffering extension is present and the buffers are in the buffering extension.

If multiple PACB buffers exist, there will be a buffering extension for each, immediately preceding the buffer. The basic PACB (or NOBUF PACB) is copied into the the ACB as words 0 through X63; an ACB "extension" is then generated in words X64 - X67. The resulting ACB thus has the following format:





| | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | |
|---|---|---|
| 0 | 2 \| COMPLETE ACB SIZE | 0 |
| 1 | \| FILE NUMBER | 1 |
| 2 | FILE NAME - 1ST CHAR. \| FILE NAME - 2ND CHAR. | 2 |
| 3 | FILE NAME - 3RD CHAR. \| FILE NAME - 4TH CHAR. | 3 |
| 4 | FILE NAME - 5TH CHAR. \| FILE NAME - 6TH CHAR. | 4 |
| 5 | FILE NAME - 7TH CHAR. \| FILE NAME - 8TH CHAR. | 5 |
| 6 | FOPTIONS | 6 |
| 7 | AOPTIONS | 7 |
| 8 | Record size in bytes | 10 |
| 9 | BLOCK SIZE IN WORDS | 11 |
| 10 | UNUSED | 12 |
| 11 | CARRIAGE CONTROL CODE | 13 |
| 12 | \|EOF\|PG \|LN \|ST \|FX \|TC \|TB \|BB \|CAR\|DB \| EOF T \| EOF M \| | 14 |
| 13 | C\| \| TE\| IC\| Q \| \| TERMINAL STOP CHARACTER | 15 |
| 14 | ERROR CODE | 16 |
| 15 | LAST I/O TRANSMISSION LOG | 17 |
| 16 | FILE POINTER | 20 |
| 17 | | 21 |
| 18 | CURRENT VARIABLE BLOCK NUMBER | 22 |
| 19 | | 23 |
| 20 | RECORD TRANSFER COUNT | 24 |
| 21 | | 25 |
| 22 | BLOCK TRANSFER COUNT | 26 |
| 23 | | 27 |
| 24 | HIGHEST BLOCK NUMBER STARTED | 30 |
| 25 | | 31 |





| | | |
|---|---|---|
| 26 | FCB VECTOR | 32 |
| 27 | | 33 |
| 28 | TOTAL NUMBER OF LACB'S | 34 |
| 29 | \|BK \| DEVICE TYPE \| LAST LOGICAL I/O STATUS | 35 |
| 30 | LOGICAL DEVICE NUMBER | 36 |
| 31 | \|PF \|WIT\| \| CURRENT BUFFER\| TAPE DISPLACE \| NO. BUFFERS | 37 |
| 32 | CURRENT RECORD WORD INDEX | 40 |
| 33 | BUFFER SIZE | 41 |
| 34 | VIRTUAL LOGICAL DEVICE NO. | 42 |
| 35 | FMAT INDEX | 43 |
| 36 | NUMBER OF INPUT LACB'S | 44 |
| 37 | NAME TYPE \| FILE DISPOSITION | 45 |
| 38 | ACCESS BIT MAP \| BLOCKING FACTOR | 46 |
| 39 | S \| M \| Q \| A \| D \| \| AE\| RV\|ABR\| ME\| SEOFS\| EOFS | 47 |
| 40 | SPOOLED DEVICE TYPE \| SPOOLED DEVICE RECORD SIZE | 50 |
| 41 | SPOOLED DEVICE FOPTIONS | 51 |
| 42 | SPOOLED DEVICE AOPTIONS | 52 |
| 43 | IOD OR ODD INDEX | 53 |
| 44 | NO-WAIT DISK ADDRESS | 54 |
| 45 | | 55 |
| 46 | UNUSED | 56 |
| 47 | NO-WAIT LOGICAL DEVICE | 57 |
| 48 | P1P2 USED BY FDEVICECONTROL | 60 |
| 49 | | 61 |
| 50 | UNUSED | 62 |
| 51 | UNUSED | 63 |





The above words, 0-X63, are physically located in the PACB of the file. Below, words X64-X67, are used by file system intrinsics- and are placed onto the stack by the procedure LOC'ACB when locking the ACB. Therefore, the buffering extension, if pres- ent, will immediately follow word X63 of the actual ACB in the Control Block Table of the file.

| | | |
|---|---|---|
| 52 | DST RELATIVE OFFSET TO PACB | 64 |
| 53 | DST RELATIVE OFFSET TO LACB | 65 |
| 54 | DST RELATIVE OFFSET TO ACB IN THE STACK | 66 |
| 55 | STACK RELATIVE OFFSET TO DB | 67 |

The following identifiers are used when referring to an ACB:

```
(ACBSIZE)      = ACB.(2:14)#,      size in words
ACBFNUM        = ACB(1).(8:8)#,    file number
ACBNAME        = ACB(2)#,          file name
ACBNAME1       = ACBDBL(1)#,       file name - first half
ACBNAME2       = ACBDBL(2)#,       file name - second half
ACBFOPTIONS    = ACB(6)#,          FOPTIONS
ACBAOPTIONS    = ACB(7)#,          AOPTIONS
ACBRSIZE       = ACB(8)#,          record size (bytes)
ACBBSIZE       = ACB(9)#,          block size (words)
Spare          = ACB(10)#,         Unused
ACBCTL         = ACB(11)#,         carriage control word
ACBLSTATE      = ACB(12)#,         local state flags
ACBEOF         = ACBLSTATE.(1:1)#, end of file sensed
ACBLPCTL       = ACBLSTATE.(2:2)#, page and line control
ACBPAGECTL     = ACBLSTATE.(2:1)#, page control
ACBLINECTL     = ACBLSTATE.(3:1)#, line control
ACBSTREAM      = ACBLSTATE.(4:1)#, stream I/O
ACBFKEYS       = ACBLSTATE.(5:1)#, restore function keys
ACBXMITCALF    = ACBLSTATE.(6:1)#, transmit CR,LF to user
ACBTBLOCK      = ACBLSTATE.(7:1)#, disable block mode
ACBBINARYIO    = ACBLSTATE.(8:1)#, 8-bit terminal transfers
ACBCARRIAGE    = ACBLSTATE.(9:1)#, carriage control flag
(ACBDEFBLOCK)  = ACBLSTATE.(10:1)#, default blocking
ACBREADCODE    = ACBLSTATE.(11:4)#, input EOF check
ACBREADTYPE    = ACBLSTATE.(11:2)#, input EOF type
ACBREADMODE    = ACBLSTATE.(13:2)#; input EOF mode
ACBMODW        = ACB(13)#,         mode word
ACBMODE        = ACBMODW.(0:8)#,   mode setting
ACBCIAOVERFLOW= ACBMODW.(0:1)#,    Signifies CIA overflow
ACBSETMODE     = ACBMODW.(4:4)#,   FSETMODE bits
ACBTAPEERROR   = ACBMODW.(4:1)#,   report recovered tape error
ACBINHIBCALF   = ACBMODW.(5:1)#,   inhibit terminal CR/LF
ACBQUIESCE     = ACBMODW.(6:1)#,   critical output verify
ACBSTOPCHAR    = ACBMODW.(8:8)#,   terminal stop character
```

```
ACBERROR    = ACB(14)#,         error code
ACBTLOG     = ACB(15)#,         last I/O transmission log
ACBFPTR     = ACBDBL(08)#,      current record number
ACBBLK      = ACBDBL(09)#,      current variable block
RCBRTFACT   = ACBDBL(10)#,      logical record TFR count
RCBBTFRCT   = ACBDBL(11)#,      block transfer count
ACBHIBLK    = ACBDBL(12)#,      highest block started
ACBFCBV     = ACBDBL(13)#,      FCB Vector table entry
ACBSWCNT    = ACB(28)#,         # of LACBs
ACBSTATW    = ACB(29)#,         access class, status, etc.
RCBBREAK    = ACBSTATW.(1:1)#,  break ($STDI#/LIST only)
RCBDTYPE    = RCBSTATW.(2:6)#,  device type
RCBRCCCL    = RCBSTATW.(2:3)#,  device access class
RCBSUBCL    = RCBSTATW.(5:3)#,  device sub-class
RCBSTATUS   = RCBSTRTW.(8:8)#,  last logical I/O status
RCBQSTATUS  = RCBSTRTW.(8:5)#,  qualifying status part
RCBGSTATUS  = RCBSTATW.(13:3)#, general status part
ACBDADDR    = ACB(30)#,         Ldev number of file
ACBBUFX     = ACB(31)#,         buffer data & misc. flags
RCBPRIV     = RCBBUFW.(0:1)#,   privileged access only
RCBHIT      = RCBBUFW.(1:1)#,   buffer hit flag
RCBCURRBUF  = RCBBUFW.(4:4)#,   current buffer nor.
RCBNUMBUFS  = RCBBUFX.(12:4)#,  number of buffers less 1
ACBBUFUSED  = ACB(32)#,         used block word count
ACBBUFSIZE  = ACB(33)#,         buffer size (words)
RCBSPVDEV   = ACB(34)#,         spooled virtual device
RCBFMAVT#   = ACB(35)#,         FMAVT index
RCBSHCNTI#  = ACB(36)#,         Number of input LACB's
ACBDNTO     = ACB(37)#,         type & disposition
RCBDNTYPE   = ACBDNTD.(0:8)#,   nsns type for dir. search
ACBDISP     = ACBDNTD.(8:8)#,   file disposition
RCBAMLD     = ACB(38)#,         access mask & LDEV
RCBACCESS   = RCBAMLD.(0:8)#,   access mask
RCBBLKFRCT  = RCBAMLD.(8:8)#,   Blocking factor of file
RCBGSTW     = ACB(39)#,         spool control flags
RCBSPOOLED  = ACBGSTW.(0:1)#,   spooled device flag
ACBSPOOLIO  = ACBGSTW.(0:2)#,   spooled I#/DUT
RCBSPSQ     = ACBGSTW.(2:2)#,   squeeze flags
ACBSPSQZ    = ACBGSTW.(2:1)#,   file squeezed
ACBSPRSQ    = ACBGSTW.(3:1)#,   request to squeeze
ACBSPDSQ    = ACBGSTW.(4:1)#,   squeeze just done
ACBNOWAITEOF= ACBGSTW.(8:1)#,   EOF advanced?
ACBNOWAITMODE= ACBGSTW.(9:1)#,  last I/O: 0=read, 1=write
ACBABORTREAD= ACBGSTW.(10:1)#,  abort broken re-read?
ACBNEWEOF   = ACBGSTW.(11:1)#,  EOF advanced - tape file
ACBSAVEEOFS = ACBGSTW.(12:2)#,  for saving ACBEOFS
ACBEOFS     = ACBGSTW.(14:2)#,  EOF flags - :EOD/:
ACBSPTYRC   = ACB(40)#,         spooled dev type/receize
ACBSPTYPE   = RCBSPTYRC.(0:6)#, spooled dev type
ACBSPREC    = RCBSPTYRC.(6:10)#,spooled dev rec size
RCBSPFOPT   = ACB(41)#,         spooled dev FOPTION#S
ACBSPAOPT   = ACB(42)#,         spooled dev AOPTION#S
ACBSPXDDX   = ACB(43)#,         IDD/ODD index
ACBNOWAITDA = ACBDBL(22)#,      Nowait disc address
```





```
Spare       = ACB(46)#,         Unused
RCBNOWAITLDEV = ACB(47)#,       Nowait logical device
ACBP1P2     = ACBDBL(24)#,      Used by FDEVICECONTROL
RCBP1       = ACB(48)#,           "   "    "   "
ACBP2       = ACB(49)#;           "   "    "   "
```

Discussion:

**ACBABORTREAD** This flag is used to abort a broken terminal re-read. The flag is set via the RBORT parameter to FUNBREAK. If the flag is set then the READ PENDING message will be aborted along with the re-read. This feature is needed to handle the BREAK...:ABORT, etc. situation.

**ACBACCCL** This is the access class part of the device type number. The following are legal values:

0 - direct (e.g. disc)
1 - serial input (e.g. card reader)
2 - parallel input/output (e.g. terminal)
3 - serial input/output (e.g. magnetic tape)
4 - serial output (e.g. line printer)

**RCBACCESS** This is the access bit map for the file. The following are the bit definitions of this eight-bit field:

(0:1) - unused
(1:1) - unused
(2:1) - read
(3:1) - append
(4:1) - write
(5:1) - lock
(6:1) - execute
(7:1) - save

This access security is determined by the ACCCHECK intrinsic and enforced by the file system.

**ACBADPTIONS** This is the FOPTIONS in effect for this file access.

**RCBBINARYID** This bit controls full eight bit transfers on the 2644 page mode terminal. It is adjusted by FCONTROL(26) and FCONTROL(27).

**RCBBLK** This is the block number of the current variable record format block. Applicable if the record format is variable.

**RCBBLKFRCT** This is the blocking factor for the file. It is the number of records in a block. Legal values range from 1 to 255.





**ACBBREAK** This is the break mode flag. It is applicable if the ACB is for $STDI# or $STDLIST. If set it means that the BREAK key has been hit and that the CI should have high priority access to the ACB. The flag will be cleared when a RESUME or FABORT is issued.

**ACBBSIZE** This is the block size, in words, of the file.

**ACBBTFRCT** This is the total number of blocks transferred to and from the file. The initial value is 00.

**ACBBUFUSED** This is the word index, relative to the base of the block, for the selected record within the block. This is applicable if the file access is buffered.

**ACBCARRIAGE** This bit signifies that the file has carriage control. It is the same as the carriage control bit in ACBFOPTION#S if the file is spooled. If not spooled, the bit is zero, and IOMOVE will pass the FWRITE carriage control parameter directly to the driver rather than embedding it as the first character of the output record.

**ACBCTL** This is the CONTROL parameter from the last FWRITE. This value is pertinent if the file was opened with carriage control.

**ACBCURRBUF** This is the buffer number (0-relative) containing the most recently referenced record. Applicable if the file access is buffered.

**ACBDADDR** This is the logical device number of the file. For a disc file this is the logical device number of the first extent.

**ACBDEFBLOCK** This bit signifies that the file is to be accessed with default blocking. The bit is initialized from the FOPEN stateword STATE. It does not need to be in the ACB; it is mentioned here only to signify that the bit is effectively used due to the way ACBLSTATE is initialized from STATE.

**ACBDISP** This is the file close disposition derived from the FOPEN call. The only way this can be specified is via a file equation. The legal values are the same as those for FCLOSE.





**ACBDNTYPE** This is the file reference format type number and is derived from the FOPEN call. The following are legal values:

0 - full name
1 - account name absent
2 - group and account name absent
3 - null name

This information is needed by FRENAME.

**RCBDTYPE** This is the device type number of the file. The following are legal values (octal):

0 - moving head disc
1 - fixed head disc
7 - foreign disc
10 - card reader
11 - paper tape reader
20 - terminal
24 - card reader/interpreter/punch
26 - SSLC
27 - programmable controller
30 - magnetic tape
31 - serial disc
40 - line printer
41 - card punch
42 - paper tape punch
43 - CALCOMP 500 plotter
44 - CALCOMP 600 plotter
45 - CALCOMP 700 plotter

**ACBEOF** This bit is set when EOF has been sensed.

**ACBEOFS** This is the type of EOF detected on $STDI#(X). This field consists of two bits:

(0:1) - super colon (i.e. EOF for $STDI#X)
(1:1) - regular colon (i.e. EOF for $STDI#)

Applicable for multi-access to $STDI#(X) only.

**ACBERROR** This is the error number for the file. It is used by all intrinsics except FOPEN. When an error is detected the error number is placed in this cell. The error number is cleared at the beginning of each callable intrinsic except FCHECK (which reads it).

**RCBFCB** This is the FCB vector for the file. Applicable only to disc files.

**ACBFKEYS** This bit controls the definition of the f1 and f2 function keys on the 2644 page mode terminal; it is

adjusted by FCONTROL(32) and FCONTROL(33). (Obsolete function)

ACBFNUM — File number, range from 1 to 255. Used mostly for calling routinee that accese things euch ae labels by file number.

ACBFOPTIONS — Thie ie the FOPTIONS in effect for thie file accese.

ACBFPTR — This is the sequential access record pointer; it contains the next sequential record number. The initial valus is 00. Thie value ie used only by the FREAD, FWRITE and FUPDATE intrineics. However the value ie maintained by all data transferring file eyetem intrinsice.

ACBFMAVTX — This is the entry index into the file multi-access vector tabls (FMAVT). This ie valid if the file accese is multi-accese.

ACBGSTATE — These are niscellaneoue stats flags. These are "global" in nature in that they are the same for all accessore in a multi-accses environment. The constituent bits are described individually.

ACBGSTATUS — This is the general part of the last I/O status for the file. The following are the legal values:

0 - pending
1 - successful
2 - end of file
3 - unusual condition
4 - irrecoverable error

ACBHIBLK — This ie the highest block number for which an anticipatory read has been issued, and ie applicable if the file access is buffered. The initial value ie -10.

ACBHIT — This ie the buffer hit flag. If set it indicatee that the last read or write request was serviced without any physical I/O required. This flag is used only for performance measurement. The code which nanipulatee it is optional to the file system, and is controlled by compiler toggle X3.

ACBINHIBCALF — This bit controle the termination of lines written to the terminal. If not eet then each line ie terminated with a CR and LF; if set then no line termination characters are used. This bit ie valid if the file is a terminal file; it is adjusted by FSETMODE.

ACBLINECTL — Thie is the line control bit. If not set then each line is post-spaced; if set then each line is prespaced. Thie bit is used by line printers and terminals only. It is adjusted by FCONTROL(1) and FWRITE with the appropriate carriage control.





ACBLPCTL — This are the line and page control bite, which are deecribed eeparately.

ACBLSTATE — These are niscellaneous state flags. They are "local" in nature in that they may be different for each acceeeor in a multi-access environnent. Bite (9:6) are initialized from the etateword local variable called STATE in FOPEN; the ten remaining bits are initialized individually. The constituent bite are deecribed individually.

ACBMODE — These are niecellaneous node flags. The conetituent bite are described individually.

ACBNAME — Thie ie the local file name. The name ie eight bytee in length with trailing blanks added.

ACBNEWEOF — This flag when set indicates that a new tape mark should be written before the tape is rewound or backspaced. Applicable only to nagnetic tape filse.

ACBNOWRITEOF — Thie bit ie used to save the value of the local EOF advanced flag NEWEOF in IOMOVE between the I/O initiation and I/O completion calle. This flag ie applicable if the file ie accessed in nowait I/O node.

ACBNOWRITMODE — This cell is used to save the I/O node between nowait I/O initiation and completion calls. If the bit ie set then the last I/O request was a write; otherwiss it was a read. Thie cell is pertinent if the file is acceesed in nowait I/O node.

ACBNUMBUFS — Thie ie the number of buffers, lsee one, used for the file accese. Applicable if the file acceee is buffered.

ACBPAGECTL — Thie is the page control bit. If not eet then a page is assuned to consist of 60 lines (auto page eject); if eet then a page is aseuned to consiet of 66 lines (no auto page eject). This is used prinarily for line printers but ie also valid for terminals; theee are the only devices for which thie ie valid. This bit ie adjusted by FCONTROL(1) and FWRITE with the appropriate carriage control.

ACBPRIV — Thie flag when set indicates that the file ie privileged in that it has a negative file code; the user must be in privileged node to access it.

ACBQSTATUS — This is the qualifying part of the last I/O etatus for the file. The values are unique for each general etatus part. See I/O System IMS for all legal values.

ACBQUIESCE — Thie bit controls critical output verification. If set, buffered output is guaranteed to have been written to the





device when control is returned to the user. Thie bit is adjusted by FSETMODE.

ACBREADCODE — This field conaiste of the input EOF checking type and node, and is used to generate the P1 parameter to ATTACHIO. Theee fields are described individually.

ACBREADMODE — Thie field controls the input EOF checking node. It is 00 for reading $STDIN, 01 for reading $STDINX, and 10 for the command interpreter.

ACBREADTYPE — Thie field controls the input EOF checking type. It ie 01 for JOBs, 10 for SESSIONs, and 00 for DATA.

ACBRSIZE — Thie is the file's record size in poeitive bytes.

ACBRTFRCT — Thie ie the total number of recorde transferred to and from the file. The initial value ie 00.

ACBSAVEEOFS — This field ie ueed to eave the contente of ACBEOFS during BREAK mode proceseing.

ACBSHCNT — This is the total number of LACBe that exist for thie PACB. Valid if the file accees is multi-accese.

ACBSHCHTIN — Thie ie the total number of input-only LACBs that exist for this PACB. Valid if the file accses ie multi-accese.

ACBSHCNTS — This is the total LACB and total input-only LACB counts, each of which ie described separately.

ACBSIZE — This ie the size, in words, of the ACB. The complete eize (including buffers) nay be calculated from the DST eize containing the ABC. It does not include the buffering extension, if present.

ACBSPROPT — Thie ie the ROPTIONS for the epooled device. Applicable if the file accese is to a spooled device.

ACBSPFOPT — This is the FOPTIONS for the epooled device. Applicable if the file access ie to a spooled device.

ACBSPOOLEO — This ie the epooled device flag. If set then the file access is to a epooled device.

ACBSPOOLIO — This field ie a combination of the epooled device flag and the input/output node of the spooled device. Legal values are:

00 - not epooled
01 - illegal
10 - input epooling
11 - output spooling





ACBSPREC — This ie the record size, in bytes, of the spooled device. Applicable if the file access ie to a spooled device.

ACBSPTYPE — This is the device type (fron the LDT) of the spooled devics. Applicable if the file accsss ie to a spooled device.

ACBSPTYRC — This cell contains the spooled device type and record eize, which are described eeparately.

ACBSPVDEV — Thie ie the logical device number of the spooled device. Applicable if the file access ie to a spooled device.

ACBSPXDDX — This is the index into the IDD or ODD for a epoolfile. Applicable if the file acceee is to either a spooled device or a spoolfile.

ACBSTATUS — Thie ie the laet I/O etatue for the file. It comes from the I/O status part of the IOCB returned by ATTACHIO. Not all ATTACHIO calls update this cell.

ACBSTOPCHAR — This is the record termination character used for terminal reade. This character can be changed via FCONTROL(25).

ACBSTAEAM — This bit signifies inter-block garbage for diec filee. If eet, the block size ie a nultiple of 128 words and therefore there is no garbage data between blocks. This fact ie used to improve multirecord I/O by napping the request into ae few ATTACHIOs ae poesible.

ACBSUBCL — Thie is the sub-class part of the device type number. The sub-claes is unique for each accese class. The following are the legal sub-class values for each device claee:

0 - direct
  0 - noving head disc
  1 - fixed head diec
  7 - foreign disc
1 - serial input
  0 - card reader
  1 - paper tape reader
2 - parallel input/output
  0 - terminal
  4 - card reader/punch
  6 - SSLC
  7 - programmable controller
3 - serial input/output
  0 - nagnetic tape
  7 - esrial diec
4 - serial output

0 - line printer
1 - card punch
2 - paper tape punch
3 - CALCOMP 500 plotter
4 - CALCOMP 600 plotter
5 - CALCOMP 700 plotter

RCBTRPEERROR — This bit controls the reporting of recovered magnetic errors. If not set the recovered errors are not reported to the user; if set then recovered errors are reported to the user by returning CCL and error number 39. Valid if the file is a magnetic tape file. This bit is adjusted by FSETMODE.

RCBTBLOCK — This bit controls block mode transfers on the 2644 page mode terminal. This bit is adjusted by FCONTROL(28) and FCONTROL(29).

RCBTLOG — This is the last I/O transmission log for the file. It comes from the I/O transmission log part of the IOCB returned by ATTACHIO. Not all ATTACHIO calls update this cell.

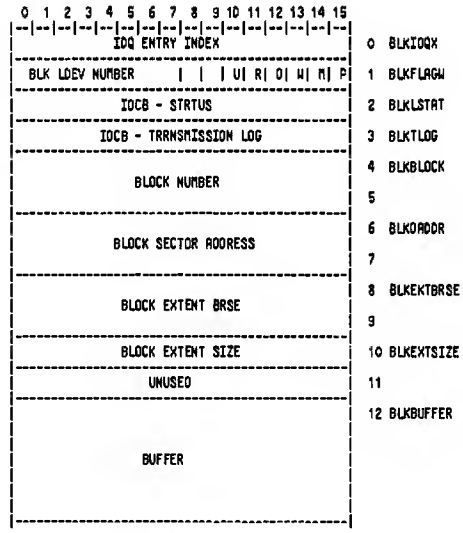
RCBVOROOR — This is the volume table index for the file. Applicable if the file is a disc file.

RCBXMITCRLF — This bit controls CR and LF insertion into the user buffer on the 2644 page mode terminal. This bit is adjusted by FCONTROL(30) and FCONTROL(31).





If present, the PACB buffering extension contains from one to eleven block buffers each having the following format:




Other identifiers used:

```
BLKFLAGW       = BLK(1)#,        Flag and LDEV word
BLKLDEV        = BLKFLAGW.(0:8)#, block logical device number
BLKFLAGS       = BLKFLAGW.(0:8)#, block I/O flags
BLKUNALLOCEXT  = BLKFLAGW.(10:1), Block from unalloc. extent
BLKREVERSE     = BLKFLAGW.(11:1), FREROBACKWRRO (not used )
BLKOONTWRIT    = BLKFLAGW.(12:1), I/O status not checked
BLKIOOUT       = BLKFLAGW.(13:1)#,last I/O was write?
BLKDIRTY       = BLKFLAGW.(14:1)#,buffer modified?
BLKIOPENO      = BLKFLAGW.(15:1)#,I/O in progress?
BLKIOCOMP      = BLKFLAGW.(14:2)#,I/O complete - not dirty
BLKIOCB        = BLKOBL(1)#,     IOCB
```





Discussion:

BLKBLOCK — This is the block number of the data contained in the buffer. A value of -10 indicates that the buffer is empty.

BLKBUFFER — This is the actual file system buffer space. Each buffer is exactly one file block in size.

BLKDADDR — This is the block's logical device and sector number.

BLKDIRTY — This flag is set if the contents of the buffer has been modified. When the block buffer is re-used this flag is checked to see if the block needs to be written to the device.

BLKOONTWAIT — This bit will be on if the I/O was already completed via "OONT'WAIT" but the status has not been checked yet. Check the status before using the block in the buffer.

BLKEXTBASE — This is the sector address of the extent base in which the block resides. This is used for disc caching.

BLKEXTSIZE — The size, in sectors, of the extent in which the block resides. This is used for disc caching.

BLKFLAGS — These are the miscellaneous flags associated with the block, which are described separately.

BLKIOCB — This is the IOCB returned by the I/O system when the block I/O has completed. On a blocked I/O request this is obtained from the ATTACHIO call; on an unblocked I/O request this is obtained from WAITFORIO.

BLKIOCOMP — This is the buffer modified flag (BLKDIRTY) and the I/O in progress flag (BLKIOPENO), which are described separately. This field is usually interrogated to see if it contains the value 2, which means that the buffer has been modified but not yet written to the device.

BLKIOOUT — This is the mode of the I/O operation for the block. It is set by a write and cleared by a read.

BLKIOPENO — This is the I/O in progress flag. It is set if the I/O is pending; it is cleared when the I/O has completed.

BLKIOQX — This is the IOQ index of the unblocked I/O request for the block. It is used as the argument to WAITFORIO, which ensures the completion of the I/O request.

BLKLDEV — This is the logical device number of the block. (Valid only for disc files.)





BLKLSTAT — The I/O status part of the IOCB consists of the PCB number and the error code for the completed I/O request.

BLKTLOG — The transmission log part of the IOCB is the number of words or bytes transferred by the the I/O request.

BLKREVERSE — This bit would indicate that we are reading back- wards from a tape. However, currently FREADBACK- WARDS can only be performed unbuffered.

BLKUNALLOCEXT — This bit signifies that the block was "read" from an unallocated extent. Actually, the buffer was simply cleared with fill characters. Therefore, if a write is attempted to the block residing in this buffer, it must pass through FCONVBLK to allocate the extent first.

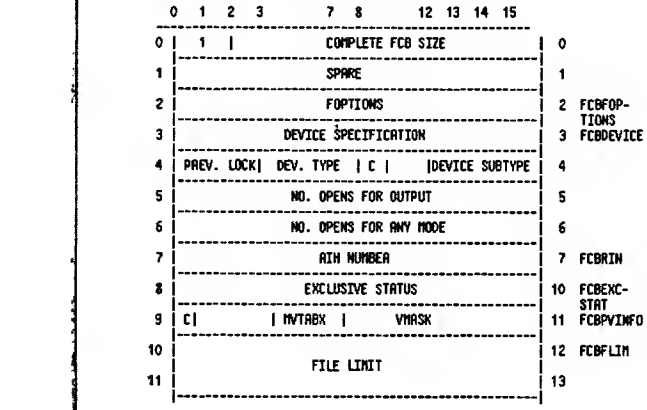
File Control Block (FCB)

The FCB coordinates access to a file on a sharable device. At present the only sharable device is a disc, so only disc files have FCBs.

The information contained in an FCB is derived from the file label. The FCB is used to hold this information, rather than the file label, since it can be accessed more quickly.

There are two strategies to choose from in deciding where to place the FCB. If the file has been opened exclusive and no other process could possibly share this file, then the FCB is placed into the PXFILE area (or in a NOBUF expandable CBT if it won't fit in the PXFILE area or if the program is run with NOCB). If the file could possible be shared, then the FCB is always placed in a shared control block table. The number of a data segment containing a list of shared file system data segments is kept in system global location 1076 octal. The size of the FCB depends on the maximum number of extents specified at FOPEN; there are 44 (octal) words plus two per extent. There will be at least one extent, since the file label always exists in the first extent. The FCB extent map is in terms of logical device and sector number. The extent map in the file label is in terms of volume rather than logical device; the map is converted by VTABOLDEV when the label is read, and converted back by LDEVTOVTAB when the label is written to disc.

The File Control Block has the following format:





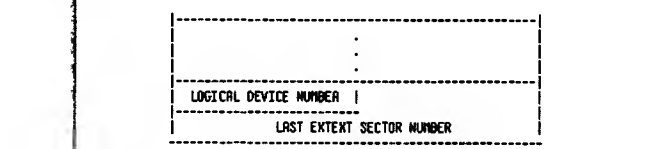



File Control Block (Cont.)








Other identifiers used:

```
FCBSIZE      = FCB.(2:14)N,     size in words
FCBLKST      = FCB(4).(0:2)#,   previous lock state
FCBDTYPE     = FCB(4).(2:6)#,   device type
FCBCRUNCH    = FCB(4).(8:1)#,   pending crunch disposition
FCBSUBTYPE   = FCB(4).(12:4)#,  device subtype
FCBDCNTOUT   = FCB(5).(0:8)#,   no. accessors - output
FCBDCNT      = FCB(5).(8:8)#,   no. accessors
FCBCLASSFLG  = FCB(9).(0:1)#,   PV class flag
FCBMVTABX    = FCB(9).(4:4)#,   Mounted volume table index
FCBVMASK     = FCB(9).(8:8)#,   Volume Mask
FCBLBLEOF    = FCB(16).(0:8)#,  no. labels written
FCBLBL       = FCB(16).(8:8)N,  no. labels available
FCBBLKFACT   = FCB(18).(0:8)#,  blocking factor
FCBSECTPBLK  = FCB(18).(8:8)N,  sectors per block
FCBSECTOFF   = FCB(19).(0:8)N,  sector offset to data
FCBDISP      = FCB(19).(8:3)N,  pending disposition
FCBNUMEXTS   = FCB(19).(11:5)#, no. extents less 1
FCBDCNTIN    = FCB(21).(8:8)#,  no. accessors - input
FCBLABEL     = FCBDBL(18)#,     label LDEV and sector
FCBLDEV      = FCB(36).(0:8)#,  label LDEV
```

Discussion:

FCBACBDST — This is the DST of the ACB that was created at the same time as the FCB. This is used in conjunction with FCBNEWFCBDST when relocating the FCB.

FCBACBV — This is the vector table entry of the ACB that was created at the same time as the FCB. This is used in conjunction with FCBNEWFCBV when relocating the FCB.

FCBAN — This is the account name of the file. It is eight bytes in length with trailing blanks added.

FCBBLKFACT — This is the blocking factor of the File. It is the number of logical records in a physical block. Legal values range from 1 to 255.





FCBDEVICE — This specifies the device on which the file resides. If it is positive then it represents a logical device number; if negative it represents a (negative) device class index.

FCBDISP — This is the pending FCLOSE disposition for the file. Legal values are:

0 - no change
1 - save permanent
2 - save temporary and rewind
3 - save temporary but do not rewind
4 - release
7 - invalid file (file label access error)

FCBCRUNCH — This bit governs if space will be returned beyond the EOF upon the last FCLOSE of the file.

0 - no change
1 - return space beyond EOF

FCBDTYPE — This is the device type number of the first extent of the file. See ACBDTYPE for a list of legal values.

FCBEND — Block number of the file's EOF, relative to FCBSTART.

FCBEOF — This is the end-of-file pointer for the file. It is a double integer representing the number of records in the file. It can also be viewed as the record number of the next record past EOF.

FCBEXCLSTAT — This is the exclusive status of the file access. If -1 then the file is being accessed exclusively; otherwise it is the number of semi-exclusive accessors.

FCBEXTMAP — This is the extent map of the file. The number of extents is specified by FCBNUMEXTS; a 0D extent descriptor indicates that the extent has not been allocated.

FCBEXTSIZE — This is the extent size, in sectors, of the file. All extents in the file except possibly the last have this size. This is a logical value, and legal values range from 1 to 65535 sectors. This restricts the maximum file size to 2097120 sectors (268,431,360 words).

FCBFLIM — This is the end-of-space pointer for the file. It is a double word integer representing the maximum number of records (fixed length record format) or blocks (undefined or variable length record format) in the file.

FCBFOPTIONS — This is the FOPTIONS in effect for the file.

FCBGN — This is the group name of the file. It is eight bytes long with trailing blanks added.

FCBLABEL — This is the logical device and sector number of the file label, which is the same as the first extent descriptor.

FCBLASTEXTSIZE — This is the size, in sectors, of the last extent in the file. If the file has one extent then this is the same as FCBEXTSIZE; otherwise this value may be different from FCBEXTSIZE. This is the size of the last physical extent for the file; it is not the size of the last allocated extent.

FCBLBL — This is the number of user labels allocated for the file. Since each label is a sector long, this is also the number of sectors allocated for user labels.

FCBLBLEOF — This is the end-of-data pointer for the user labels. It is analogous to FCBEOF in that it represents the number of labels written. The initial value is 0.

FCBLDEV — This is the logical device number of the first extent of the file.

FCBLKST — This is the previous lock state of the file and is derived from the file label. Legal values are:

0 - no access
1 - read
2 - write
3 - read/write

FCBMVTABX — If the file resides on a private volume, then this field represents the mounted volume table index of the volume set entry on which the file resides.

FCBNEWFCBDST — This is the DST of the new FCB for the file. It is used in conjunction with FCBACBDST to move the FCB to a system (shared FCB) control block table when the second accessor is established. If this value is zero then there is no new FCB; if nonzero then a new FCB has been created.

FCBNEWFCBV — This is the vector table entry of the new FCB for the file. It is used in conjunction with FCBACBV to move the FCB to a system (shared FCB) control block table when the second accessor is established. If this value is zero then there is no new FCB; if nonzero then a new FCB has been created.

FCBNUMEXTS — This is the maximum number of extents, less one, allowed for the file. It is not the number of extents





presently allocated, which is always determined by counting nonzero entries in the extent map.

FCBNUMOPENCLSREC — Number of open and close records in the message file.

FCBOCNT — This is the number of accessors for the file. Alternatively it can be viewed as the number of FACBs created for the file.

FCBOCNTIN — This is the number of file accessors having input access.

FCBOCNTOUT — This is the number of file accessors having output access.

FCBRIN — This is the RIN number used to support dynamic locking (i.e. FLOCK and FUNLOCK) for the file. If there is no dynamic locking then this number is zero.

FCBSECTOFF — This is the sector offset from the file label to the first block of the file. This is not necessarily equal to FCBLBL+1 since an integral number of blocks are allocated for the file and user labels.

FCBSECTPBLK — This is the number of sectors in a block for the file.

FCBSIZE — This is the size, in words, of the complete FCB. It includes the extent map.

FCBSTART — Block number of the file's start, excluding the file label block.

FCBSUBTYPE — This is the device subtype number of the first extent.

FCBUSERLBL — This field describes the user labels for the file. It consists of FCBLBL and FCBLBLEOF, described separately.

FCBVMASK — If the file resides on a private volume set, this bit mask signifies which volume of the set in which the file resides. Bit 15 is on if resides on the first volume, bit 14 if on the second, etc.





File Label (FLAB)

The file label has the following format:

| 0 1 2 3 | 4 5 6 7 | 8 9 10 11 | 12 13 14 15 | | |
|---|---|---|---|---|---|
| FILE NAME - 1ST CHAR. | | FILE NAME - 2ND CHAR. | | 0 | FLLDCNAME |
| FILE NAME - 3RD CHAR. | | FILE NAME - 4TH CHAR. | | 1 | |
| FILE NAME - 5TH CHAR. | | FILE NAME - 6TH CHAR. | | 2 | |
| FILE NAME - 7TH CHAR. | | FILE NAME - 8TH CHAR. | | 3 | |
| GROUP NAME - 1ST CHAR. | | GROUP NAME - 2ND CHAR. | | 4 | FLGRPNAME |
| GROUP NAME - 3RD CHAR. | | GROUP NAME - 4TH CHAR. | | 5 | |
| GROUP NAME - 5TH CHAR. | | GROUP NAME - 6TH CHAR. | | 6 | |
| GROUP NAME - 7TH CHAR. | | GROUP NAME - 8TH CHAR. | | 7 | |
| ACCT NAME - 1ST CHAR. | | ACCT NAME - 2ND CHAR. | | 10 | FLACCTNAME |
| ACCT NAME - 3RD CHAR. | | ACCT NAME - 4TH CHAR. | | 11 | |
| ACCT NAME - 5TH CHAR. | | ACCT NAME - 6TH CHAR. | | 12 | |
| ACCT NAME - 7TH CHAR. | | ACCT NAME - 8TH CHAR. | | 13 | |
| CREATOR NAME - 1ST CHAR. | | CREATOR NAME - 2ND CHAR. | | 14 | FLUSERID |
| CREATOR NAME - 3RD CHAR. | | CREATOR NAME - 4TH CHAR. | | 15 | |
| CREATOR NAME - 5TH CHAR. | | CREATOR NAME - 6TH CHAR. | | 16 | |
| CREATOR NAME - 7TH CHAR. | | CREATOR NAME - 8TH CHAR. | | 17 | |
| LOCKWORD - 1ST CHAR. | | LOCKWORD - 2ND CHAR. | | 20 | FLLOCKWORD |
| LOCKWORD - 3RD CHAR. | | LOCKWORD - 4TH CHAR. | | 21 | |
| LOCKWORD - 5TH CHAR. | | LOCKWORD - 6TH CHAR. | | 22 | |
| LOCKWORD - 7TH CHAR. | | LOCKWORD - 8TH CHAR. | | 23 | |
| SECURITY MATRIX | | | | 24 | FLSECMX |
| | | | | 25 | |
| FILE LANGUAGE ATTRIBUTE | | | SA \| S | 26 | |





File Label (Cont.)

| | | |
|---|---|---|
| CREATION DATE | 27 | FLCREATE |
| LAST ACCESS DATE | 30 | FLLASTACC |
| LAST MODIFICATION DATE | 31 | FLLASTMOD |
| FILE CODE | 32 | FLFILECODE |
| C \| MVTABX \| VMASK | 33 | FLPVINFO |
| S \| A \| L \| X \| SUBTYPE \| DISC TYPE \| A/W | 34 | FLLOCK |
| NO. USER LABELS WRITTEN \| NO. USER LABELS AVAIL. | 35 | FLUSERLBL |
| FILE LIMIT IN BLOCKS | 36 | FLFLIM |
| | 37 | |
| FCB VECTOR | 40 | FLFCBVECT |
| | 41 | |
| CHECKSUM | 42 | FLCHECKSUM |
| COLD LOAD ID | 43 | FLCLID |
| FOPTIONS | 44 | FLFOPTIONS |
| RECORD SIZE IN BYTES | 45 | FLRECSIZE |
| BLOCK SIZE IN WORDS | 46 | FLBLKSIZE |
| SECTOR OFFSET \| \| NO. EXTENTS -1 | 47 | |
| LAST EXTENT SIZE IN SECTORS | 50 | FLLASTEXT-SIZE |
| EXTENT SIZE IN SECTORS | 51 | FLEXTSIZE |
| END OF DATA POINTER | 52 | FLEOF |
| | 53 | |
| VOLUME TABLE INDEX \| | 54 | FLEXTMAP |
| 1ST EXTENT SECTOR NUMBER | 55 | |

File Label (Cont.)

| | | |
|---|---|---|
| . | | |
| . | | |
| . | | |
| VOLUME TABLE INDEX | | |
| LAST EXTENT SECTOR NUMBER | | |
| . | | |
| . | | |
| . | | |
| FILE ALLOCATION TIME | 154 | FLALLOCTIME |
| | 155 | |
| FILE ALLOCATION DATE | 156 | FLALLOCDATE |
| . | | |
| START OF FILE BLOCK NUMBER | 160 | FLSTART |
| | 161 | |
| BLOCK NUMBER OF END OF FILE | 162 | FLEND |
| | 163 | |
| NUMBER OF OPEN AND CLOSE RECORDS (MESSAGE FILE) | 164 | FLNUMOPENCLSREC |
| | 165 | |
| LAST FILE MODIFICATION TIME | 166 | FLMODTIME |
| | 167 | |
| UNUSED | 170 | |
| | 173 | |
| DEVICE NAME - 1ST CHAR. \| DEVICE NAME - 2ND CHAR. | 174 | FLDEVNAME |
| DEVICE NAME - 3RD CHAR. \| DEVICE NAME - 4TH CHAR. | 175 | |
| DEVICE NAME - 5TH CHAR. \| DEVICE NAME - 6TH CHAR. | 176 | |
| DEVICE NAME - 7TH CHAR. \| DEVICE NAME - 8TH CHAR. | 177 | |

Other identifiers used:





```
FLSECURE      = FLAB(22).(15:1)%,   file secure bit
(FLSRRELEASE)= FLAB(22).(14:1)%,   STORE/RESTORE releaeed bit
FLCLASSFLG    = FLPVINFO.(0:1)%,   Clese flag bit
FLMNTABX      = FLPVINFO.(4:4)%,   Mounted volume table index
FLVMASK       = FLPVINFO.(8:8)%,   Volume naek
(FLSTORE)     = FLAB(28).(0:1)%,   file being stored
FLRESTORE     = FLAB(28).(1:1)%,   File being restored
(FLLOAD)      = FLAB(28).(2:1)%,   File loaded
FLEXCL        = FLAB(28).(3:1)%,   exclusive acceee
FLSR          = FLAB(28).(0:2)%,   S & R bite
FLSRL         = FLAB(28).(0:3)%,   S, A, & L bite
(FLSRLX)      = FLAB(28).(0:4)%,   S, A, L, & X bite
FLSUBTYPE     = FLAB(28).(4:4)%,   device eubtype
FLDTYPE       = FLAB(28).(8:6)%,   device type
FLSTATUS      = FLAB(28).(14:2)%,  write/read etatue
(FLLBLEOF)    = FLAB(29).(0:8)%,   no. labele written
(FLLBL)       = FLAB(29).(8:8)%,   no. labels available
FLSECTOFF     = FLAB(39).(0:8)%,   sector offeet to data
FLNUMEXTS     = FLAB(39).(11:5)%,  no. extents less 1
FLLABEL       = FLABDBL(22)%,      label VTAB and eector
FLVTAB        = FLAB(44).(0:8)%,   lebel VTAB index
```

Discussion:

FLACCTNAME — This is the account name of the file. It is eight bytee in length with trailing blanke added.

FLALLOCDATE — Date that the file was allocated on thie eyetem.

FLALLOCTIME — Doubleword conteining the time that the file was allocated on thie system.

FLBLKSIZE — Thie is the block eize, in eectors, of the file.

FLCHECKSUM — Thie ie the exclusive-OR checkeum of the file label (excluding words 34, 42, and 43 octal) and is used for error detection. Eech time the file label is read from disc the check sun ie calculated and compared against the value recorded in the file label. Similarly, each time the file label ie written to the disc the check sun ie calculated and inserted into the file label.

FLCLID — Thie ie the cold load number in effect the laet time that the file was acceseed. This should always be the current cold load number. If it is not, it means that the eyetem craehed while the file was open and that the data in the file label should be "reset" (principally the FCB vector FLFCBVECT).

FLCRERTE — Thie is the creation date of the file. It ie in the formet defined by the intrinsic CRLENDAR.





FLDEVNAME — Thie ie the FOPEN device specification that was used when the file was created. Thie information ie needed when new extente ere ellocated.

FLDTYPE — This ie the device type number of the firet extent of the file; eee RCBDTYPE for e list of legal veluee. Thie value ie determined by configuretion.

FLEND — Number of current data blocke (thet ie, the end of file block number relative to the start of File).

FLEOF — Thie ie the end-of-file pointer for the file. It ie e double word integer representing the number of records in the file. It can also be viewed as the record number of the next record paet EOF.

FLEXCL — Thie is the exclusive accees flag for the file. If eet it means that the file has been opened exclusively by e eingle acceesor. If not eet then the file ie potentially accessible by othere.

FLEXTMAP — This is the extent nap of the File. The number of extente ie specified by FLNUMEXTS; a 0D extent descriptor indicetee thet the extent hee not been elloceted.

FLEXTSIZE — Thie ie the extent eize, in eectore, of the file. All extents in the File, except the leet, heve thie extent eize. Thie ie e logical value, and legel veluee range from 1 to 65535 sectore. Thie limite the maximum file eize to 2097120 eectors.

FLFCBVECT — IF nonzero, this ie the vector of the FCB for the file. If zero, the file ie not being acceeeed.

FLFILECODE — This is the file code of the file. Known values ere:

| | |
|---|---|
| 1024 | User Subprogram Library |
| 1025 | Basic Date |
| 1026 | Basic Program |
| 1027 | Besic fast Progrem |
| 1028 | Relocatable librery |
| 1029 | Progrem File |
| 1031 | Segmented Library |
| 1035 | View Form File |
| 1036 | View Fast Forme file |
| 1037 | View Reformet File |
| 1040 | Croes Loader RSCII File (SAVE) |
| 1041 | Cross Loeder Relocated Binary File |
| 1042 | Croes Loader ASCII File (DISPLAY) |
| 1050 | Edit Quick File |
| 1051 | Edit XEEPO File (COBOL) |
| 1052 | Edit TEXT file (COBOL) |
| 1054 | TDP Diary File |





| | |
|---|---|
| 1055 | TDP Proof Marked QMARKED |
| 1056 | TDP Proof Marked non-COBOL File |
| 1057 | TDP Proof Marked COBOL File |
| 1058 | TDP Workfile |
| 1059 | TDP Workfile (COBOL) |
| 1060 | RJE Punch File |
| 1070 | QUERY Procedure File |
| 1080 | KSAM Key file |
| 1083 | GRAPH Specification File |
| 1084 | User Logging Log File |
| 1090 | Self-describing File |
| 1100 | HPWORD Document |
| 1101 | HPWORD Hyphenation dictionary |
| 1102 | HPWORD Configuration File |
| 1103 | HP 2601 Environment File |
| 1110 | IDS/3000 Character Cell File |
| 1111 | IDS/3000 Form File |
| 1112 | IFS/3000 Environment file |
| 1114 | Graphics Image in RRSTR Formet |
| 1130 | OPT/3000 Log file |
| 1131 | TEPE/3000 Script File |
| 1132 | TEPE/3000 Log file |
| 1133 | APS/3000 Log file |
| 1139 | MPEDCP/DRP Log File |
| 1140 | MPToolset Root File |
| 1141 | MPTooleet Data File |
| 1145 | Drawing File for HPDRAW |
| 1146 | Figure file for HPDRAW |
| 1147 | Reserved |
| 1148 | Reserved |
| 1149 | Reserved |
| 1152 | Compreseed SLATE File |
| 1153 | Expanded SLATE Workfile |
| 1156 | Store File for RAPID/3000 Utility DICTDBU |
| 1157 | Code File for Trensect/3000 Compiler |
| 1158 | Code File for Report/3000 Compiler |
| 1159 | Code File For Inform/3000 Compiler |
| 1166 | HPDESK Distribution list |
| 1167 | HPDESK Text |
| 1177 | Term Type File |
| 1178 | Term Vertical Format Control File |
| 1192 | Network Configuration File |
| 1193 | Network Trace File |
| 1194 | Network Log File |
| 1211 | RNODE |
| 1212 | INODE |
| 1226 | VC File |
| 1227 | DIF File |
| 1228 | Language Definition File |
| 1229 | Character Set Definition File |
| 1230 | Formatted Rpplication Message Catalog |
| 1235 | Reserved |
| 1236 | Reserved |

1258 Pathflow STATIC File
1259 Pathflow DYNAMIC File

8000
to Reserved for RPL
8099

FLFLIM This is the end-of-space pointer for the file. It is a double integer representing the maximum number of records (fixed length record format) or blocks (undefined or variable length record format) in the file.

FLFOPTIONS This is the FOPTIONS of the file.

FLGRPNAME This is the group name of the file. It is eight bytes long with trailing blanks added.

FLLABEL This is the volume table index and sector number of the file label, which is the same as the first extent descriptor.

FLLASTACC This is the last access date of the file. It is in the format defined by the intrinsic CALENDAR.

FLLASTMOD This is the last modification date of the file. It is in the format defined by the intrinsic CALENDAR.

FLLASTEXTSIZE This is the size, in sectors, of the last extent in the file. If the file has one extent, then this is the same as FLEXTSIZE; if the file has more than one extent, then this value may be different from FLEXTSIZE. This is the size of the last physical extent for the file; it is not the size of the last allocated extent.

FLLBL This is the number of user labels allocated for the file. Since each label is a sector long, this is also the number of sectors allocated for user labels.

FLLBLEOF This is the end-of-data pointer for the user labels. It is analogous to FLEOF in that it represents the number of labels written.

FLLORO This is the LOADED flag for the file. If set, it means that the file is a loaded program or SL file and cannot be modified except by a privileged accessor. This flag is set and cleared by the loader, not the file system.

FLLOCK This identifies the word containing the lock bits, which are described separately.

FLLOCKWORD This is the lock word of the file. It is eight bytes long with trailing blanks added. If it is all blanks, then the file does not have a lockword.





FLLOCNAME This is the local name of the file. It is eight bytes long with trailing blanks added.

FLMODTIME Last time the file was modified.

FLNUMEXTS This is the number of extents, less one, allowed for the file. It is not the number of extents allocated. Legal values range from 0 to 31, i. e., 1 to 32 extents.

FLNUMOPENCLSREC Number of open and close records in the message file.

FLPVINFO File label private volume information. This is in the same format as the FCBPVINFO.

FLRECSIZE This is the record size of the file in negative bytes.

FLRESTORE This is the RESTORE flag for the file. If set, it means that the file is being RESTOREd and cannot be accessed. RESTORE also sets the STORE bit for the file (FLSTORE); see FLSR for a full description of the use of these bits. This flag is set and cleared by STORE/RESTORE, not the file system.

FLSECMX This is the security matrix of the file. The bits are organized into five groups of six bits each. (Bits 0:2 are not used.) The groups correspond to the access types: READ, APPEND, WRITE, LOCK, and EXECUTE. Within each group, each bit specifies who may have the access: ANY, ACCOUNT MGR, ACCOUNT LIB- RARIAN, GROUP, GROUP LIBRARIAN, CREATOR.

FLSECTOFF This is the sector offset from the file label to the first block of the file. This is not necessarily equal to FLLBL+1 since an integral number of blocks are allocated for the file and user labels.

FLSECURE This is the file security enforcement flag for the file. If not set, then the file has been RELEASEd and the security matrix FLSECMX should be ignored. If set, then secure as specified by the security matrix.

FLSR This is the STORE and RESTORE flags for the file, which are described separately. STORE and RESTORE decode the two-bit field to indicate their operation. Legal values are:

0 - file not in use by either STORE or RESTORE
1 - illegal value
2 - file being STOREd
3 - file being RESTOREd

The file system interprets the leftmost bit as indicating that the file is being accessed by either STORE or RESTORE. The rightmost bit is interpreted as indicating what access should be permitted: 0 (file being STOREd) allows read access; 1 (file being RESTOREd) allows no





access. This field is set and reset by STORE/RESTORE, not the file system.

FLSRL This is the STORE, RESTORE and LOADED flags for the file, which are described separately.

FLSRLX This is the STORE, RESTORE, LOADED and exclusive flags for the file, which are described separately.

FLSRRELEASE This flag is used by STORE/RESTORE. If a file is STOREd with the ";RELEASE" keyword, STORE will set this flag in the tape copy of the file label. RESTORE will allow any user to access such files, regardless of the file's normal security. If this bit is off in the tape copy of the file label, RESTORE applies normal security checks (as defined by the information in FLSECMX and FLSECURE). This bit is zero for files on disc.

FLSTART Block number of the file's start, excluding the file label block.

FLSTATUS This is the read/write status of the file. Legal values are:

0 - no accessors
1 - read
2 - write
3 - read/write

FLSTORE This is the STORE/RESTORE flag for the file. If set it means that the file is being either STOREd or RESTOREd. The RESTORE bit (FLRESTORE) must be interrogated to determine which operation is taking place; see FLSR for a full description of the use of these bits. This flag is set and cleared by STORE/RESTORE, not the file system.

FLSUBTYPE This is the device subtype number of the first extent of the file. This value is determined by configuration.

FLUSERID This is the creating user name of the file. It is eight bytes long with trailing blanks added.

FLUSERLBL This field describes the user labels of the file. It consists of FLLBL and FLLBLEOF, which are described separately.

FLVTRB This is the volume table index of the first extent of the file.





File Multi-Access Vector Table (FMAVT) OST(%54)

The FMAVT is used to locate shared PACB's for files opened multi-access. When an old disc file has been opened multi-access, the FMAVT is searched to determine if the file has previously been opened. The JITOST and the DADOR found in the FMAVT are compared to the JITOST of the job and the DADOR of the device or disc file being opened multi-access. If an entry exists for the file, then the PACB can be easily located for that file. If this is the first process opening the file, then an entry is created and inserted into the FMVAT for the file.

Spoolfiles are opened multi-access, therefore, they will have entries in the FMAVT. $STDIN and $STDLIST also have entries in the FMAVT since they too are opened multi-access.

Zero Entry Format

| | |
|---|---|
| CURRENT TABLE SIZE | 0 FM'CURR'SIZE |
| ENTRY SIZE = 6 | 1 FM'ENTRY'SIZE |
| MAXIMUM TABLE SIZE | 2 FM'MAX'SIZE |
| 0 | 3 |
| 0 | 4 |
| 0 | 5 |

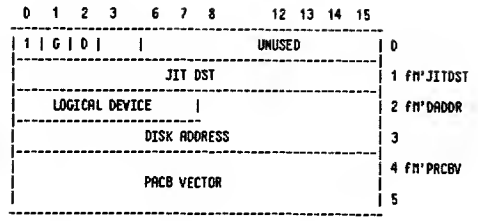
Descriptions:

FM'CURR'SIZE The current size of the FMAVT in words. This value increases in increments of %200 words until FM'MAX'SIZE is reached.

FM'MAX'SIZE The maximum allowable size in words that the FM'CURR'SIZE can get. The current value of this is %4000. FM'MAX'SIZE can be changed only by changing the code in Initial. The open of the multi-access file is failed if this maximum is reached.

FM'ENTRY'SIZE Size in words of an FMAVT entry, 6 words at present.

Typical Entry format




```
FM'DEVICE    = FMAVT(0).(2:1)M,    Devics bit
fM'GLOBRL    = fMAVT(0).(1:1)M,    Global multi-access bit
FM'LDEV      = FM'DADDR(0).(0:8)M, Logical devics number of fils
```

Descriptions:

FM'DADDR — The disc address of ths fils labsl for disc files. For dsvics filss, ths disc sddress is zsro.

FM'DEVICE — This bit is 1 for dsvics filss and 0 for disc filss.

FM'LDEV — Logical devics numbsr of dsvics filss or the LDEV of the disc containing the fils label for disc filss.

FM'JITDST — The DST numbsr of ths JIT for the job thst has the fils open. If this fisld is nonzero, then only processes in the fanily tres of this particular job can open the file. This fisld is zero if the fils was opsn global multi-accsss.

FM'GLOBAL — This bit is 1 if ths fils was opsnsd globsl multi-accsss, this sllows multi-access to the fils between jobs.

FM'PRCBV — Ths PACB vector for this multi-accsss fils. Used to easily find ths Physical Accsss Control Block for filss opened multi-accsss.





Systsn Global Rrea (SYSGLOB)

Ths fils systsn usss sevsrsl words in ths systsn global srea for its own uss.

```
SWFCBDST     = SYSDB+%76,     shared CBT DST no.
MONITOR      = SYSDB+%77,     monitoring flag word
MAXSSECT     = SYSDB+%100,    max # spoolfils ssctore
NUMSSECT     = SYSDB+%102,    current # spoolfils ssctore
EXTSSECT     = SYSDB+%104,    # ssctore/spoolfils sxtsnt
SPOOLINDEX   = SYSDB+%132,    class spool index
CSIOWAIT     = SYSDB+%135,    CSIOWRIT PLABEL
CCLOSEPLABL  = SYSDB+%140,    CS CCLOSE PLABEL - FPROCTERM
DSCHKPLABL   = SYSDB+%335,    DSCHECK PLABEL
DSOPENPLABL  = SYSDB+%336,    DSOPEN PLABEL
DSCLOSEPLABL = SYSDB+%337,    DSCLOSE PLABEL
SDSLDEVLABEL = SYSDB+%323,    PLABEL for SDSLDEV
MANWCPLABL   = SYSDB+%340;    MANAGEWRITECDMV PLABEL
GLOBALAFTDST = SYSGLBEXT+%121 Global AFT DST numbsr
```

SIRs, Locks, and Deadlocks

The file systsn usss tuo SIRs: the fils SIR, which is intsnded to protect fils label integrity, and ths fMAVT SIR, which is to gusrantss the integrity of the fMAVT. Sincs the file systsn locks thsss resources and slso locks control blocks, deadlocks can occur if locking is done in the wrong order. Not only must the fils systsn handle locking correctly, but ths sntire ensenbls of the fils systsn, its callsrs, snd its callsss must do so also. Thess include KSAM, which has a SIR of its own, SYSDUMP, and STORE, which lock the fils SIR becauss thsy tweak bits in fils labsls. Ths pressntly accepted order is:

Get FMAVT SIR Lock ACB Get File SIR Lock FCB

It nay not be necsssary to do all of thess things in any particulsr procsdure. In nodifying s procsdure, you should bs sure that sny of thess locks which you change are consistsnt not only within your own code, but also with its callsrs and callses.





Shared CBT DST

In sysglobal %76 (ABSOLUTE %1076) thsre sxists the shared Control Block Tabls DST number. This DST holds a list of shared CBT's. Shared CBT's sre used to keep any and all fils systsn control blocks that have the potsntial to be shared between processss. Any disc fils opsned shared will havs its fCB kept in one of thess CBT's. Rlso, sll tsrminal PACB's will be stored in a system shared CBT so that an sxtra dats segnsnt is not wastsd. This is possibls because all tsrminal accsss is performed NOBUF, which means thst the PACB will be s ninimal PACB and can be placsd in these CBTs. Lastly, any fils opened with global fils accsss will have all its control blocks placed into these systsn CBT's.

The format of the systsn shared CBT DST is similar to s Control Block Tabls. It has the same words of overhsad and ths data (ths list of DST's) starts in the next word aftsr ths overhsad. The systsn CBT's sre crestsd one at a tins as needed. Usually, there are only a few DST's in the list.

| | |
|---|---|
| TABLE SIZE IN WORDS (%200) | 0 |
| DST NUMBER OF THIS TABLE | 1 |
| 0 | 2 |
| 0 | 3 |
| 0 | 4 |
| 0 | 5 |
| 0 | 6 |
| 0 | 7 |
| 1ST. SHARED CBT DST NUMBER | 10 |
| 2ND. SHARED CBT DST NUMBER | 11 |
| . | |
| . | |
| . | |
| 118TH. SHARED CBT DST NUMBER | 177 |

## CHRPTER 7 PROCESS TRBLES

The operating system maintains state, control, and accounting information on each process. The data structures for this purpose are the process control block table (PCB; core resident, 1 entry per process) and the process control block extension (PCBX; contained in the process' stack below DL). Process related information which must be accessible when the process' stack is not present in main memory is maintained in the process' PCB entry. Rll other process related information is maintained in the process' PCBX.

R process is identified in the system by its PCB entry number, referred to as its PIN (process identification number), or by its PCBPT=(PIN)*(PCB entry size).

The structure of the PCB table, PCB entry format, PCBX structure, and PCBX format are specified in this chapter.

### Process Control Block Table Structure and Format

#### Fixed Cells Related to PCB

4 PCB relative index of current process' PCB entry
%1003 SYSGLDB relative address of the PCB table base
The bank & address are represented as per the MPEV ERS.
%1271 PCB relative address of head of dispatching queue's PCB entry
%1272 PCB relative address of tail of dispatching queue's PCB entry





#### PCB Entry 0 Format

| | |
|---|---|
| 0 | # OF CONFIGURED ENTRIES |
| 1 | ENTRY LENGTH (%25) |
| 2 | # OF UNRSSIGNED ENTRIES |
| 3 | TRBLE RELATIVE INDEX TO FIRST UNRSSIGNED ENTRY |
| 4 | TRBLE RELATIVE INDEX OF LAST FREE ENTRY |
| 5 | HIGH WRTER MRRK |
| 6 | NUMBER OF PRIMRRY CONFIGURED ENTRIES (0) |
| 7 | HERD OF IMPEDED QUEUE PCB RELATIVE INDEX |
| 8 | TRIL OF IMPEDED QUEUE PCB RELATIVE INDEX |
| 9 | NUMBER OF CURRENTLY IMPEDED PROCESSES |
| 10 | NUMBER OF MRXIMUM IMPEDED PROCESSES (CURRENT) |
| 11 | CUMULATIVE NUMBER OF IMPEDED PROCESSES(CURRENT) |
| 12 | 0 |
| 13 | 0 |
| 14 | 0 |
| 15 | 0 |
| 16 | 0 |
| 17 | 0 |
| 18 | D |
| 19 | 0 |
| 20 | D |





#### Unassigned PCB Entry Format

| | |
|---|---|
| D | 0 |
| 1 | TRBLE RELATIVE INDEX TO NEXT UNRSSIGNED ENTRY |
| | . . . |
| 20 | %177777 |

Note: Only word 1 and word 20 are valid for an unassigned PCB entry.





#### Rssigned PCB Entry Format

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PCB00 | S R | B F | C R | N S | P I | H S | I P | P C | D S | L W | S W | T R | U S | H I | S T | R I | RESRBORTINFO |
| | R | | I | I | D | P | E | | O | | | W | E | P | O | T | |
| | | | T | R | V | R | X | | F | | | D | R | V | B | | |
| | | | | | R | I | P | | T | | | Q | I | R | K | | |
| PCB01 | SLL RELATIVE RDDRESS OF PROCESS' SEGMENT LOCRLITY LIST | | | | | | | | | | | | | | | | SLLPTR |
| PCB02 | R D B | / / / | XDS | | | | | | DST# | | | | | | | | DBXDSINFO |
| PCB03 | R O | S C | STK | | | | | | DST# | | | | | | | | STKINFO |
| PCB04 | M | R G | R L | M R | B I O | I I D | C P | H K | I M | S G | D N | FR | M | I I | S P | T R | WAKEMASK |
| | | | | | | | | | | | | | M | I | I | E | |
| | | | | | | | | | | | | | M | | M | M | |
| PCB05 | FRTHER'S PCB INDEX | | | | | | | | | | | | | | | | FRTHERINFO |
| PCB06 | SON'S PCB INDEX | | | | | | | | | | | | | | | | SONINFO |
| PCB07 | BRDTHER'S PCB INDEX | | | | | | | | | | | | | | | | BRDTNERINFO |
| PCB08 | PSIM | W S O F T | OR | D E R D | F R C | ////////////////////// | | | | | | | | | | | PIINFONIMPPIN |
| PCB09 | L I V | BMS | PPC | S D V | PTYPE | | | | | | S I | HK | SX | ST | HB | CY | BK | PROCSTRTE |
| PCB1D | EVENT FLAGS | | | | | | | | | | | | | | | WS | EVENTFLAGS |
| PCB11 | SEGIDENTIFIER OF LAST REFERENCED | | | | | | | | | | | | | | | | LASTREFSWAPSEG |
| PCB12 | SWRPPRBLE CODE SEGMENT | | | | | | | | | | | | | | | | |
| PCB13 | D I S P Q | L Q | C | D | E | I N T E R | C O R E T | R S O F T | PRIORITY | | | | | | | | QUEUEINGINFO |

Assigned PCB Entry Format (Cont.)

```
PCB14|                BLKINX                 | PBN
     |---------------------------------------|
PCB15|           CST MAPPING OST #           | MAPOST
     |---------------------------------------|
PCB16|              PIMP PCB INDEX           | PIMPPIN
     |---------------------------------------|
PCB17|              NIMP PCB INDEN           | NIMPPIN
     |---------------------------------------|
PCB18|                BPTLINK                | BPTLINK
     |---------------------------------------|
PCB19|    PCB INDEX OF NENT PCB ENTRY IN QUEUE| NQPTR
     |---------------------------------------|
PCB20|  PCB INDEX OF PREVIOUS PCB ENTRY IN QUEUE | PQPTR
     |---------------------------------------|
```

PCB00 .(0:1) SAR ==> scheduling attention required
.(1:1) Bounds Flag -- Privilege mode bounds check
.(2:1) CRIT ==> process is critical
.(3:1) HSIR ==> process has a sir
.(4:1) PIOVR ==> pending PI, proceee critical
.(5:1) HSPRI ==> hold sir priority
.(6:1) IPEXP ==> incore protect expired
.(7:1) PC ==> pre-empt capability
.(8:1) OSOFT ==> Delayed soft int processing. A pending soft int cannot be proceesed becauee of eir or critical state. PSEUDOINT will be invoked when these condition(s) go away.
.(9:1) LW ==> long wait
.(10:1) SW ==> short wait
.(11:1) TRW ==> terminal read wait
.(12:1) USEDQ ==> used a quantun eince traneaction began
.(13:1) HIPRI ==> hold inpeded priority
.(14:1) STOVR ==> processing abort due to stack overflow.
.(15:1) RITBK==> Request Information Table Break

PCB01 .(0:16) SLLPTR, SLL relative index to process' segment locality list

PCB02 .(0:1) ADB, set if DB pointing to an absolute addrees
.(2:14) XDS, DST entry number of extra data segments to which DB is set; zero if none.

PCB03 .(0:1) STOVRALL FLAG ==> stack overflow is already allocated
.(1:2) SC, set if executing systen code
.(2:14) DST entry number of process' stack

PCB04 .(0:1) M, mourning wait.
.(1:1) RG, global RIN wait.
.(2:1) RL, local RIN wait.





.(3:1) MR, nail wait.
.(4:1) BIO, blocked I/O wait.
.(5:1) IO, I/O wait.
.(6:1) UCP, UCOP wait and RIT wait.
.(7:1) JNK, junk wait.
.(8:1) TIM, tiner wait.
.(9:1) MSG, file eyeten basic IPC neeeage wait.
.(10:1) SON, eon wait.
.(11:1) FR, father wait.
.(12:1) IMP, proceee waiting to be uninpeded.
.(13:1) SIR, process waiting for a sir.
.(14:1) TIM, process waiting for a tine out.
.(15:1) MEM, process waiting for nenory.

PCB05 .(0:16) FPIH, father's PCB relative index

PCB06 .(0:16) SPIN, son'e PCB relative index

PCB07 .(0:16) BPIN, brother's PCB relative index

PCB08 .(0:3) PSIM, pseudo - interrupt node
1: hard kill
2: soft kill
3: etop
4: hibernate
5: escape
6: break
7: nornal
.(3:1) RSOFT, OK for soft interrupt to wake proceee even though it is waiting on another event.
.(4:2) DR
0: other source
1: father
2: son
3: reply done on RIT wait
.(6:1) DEAD, set during expiration.
.(7:1) FAC, if set, the father is to be activated on procese termination.

PCB09 .(0:1) LIVE, set if process is alive.
.(1:2) BMS, block nail, valid if MR set
0: sent to father
1: received fron father
2: eend to son
3: received eon
.(3:2) PPC, process to process communication, set with respect to son.
0: null
1: son to father
2: father to son
3: blocked
.(5:1) STOV, stack overflow bit
.(6:3) PTYPE, process type
0: user





1: ueer, eon of nain
2: user, nain
3: user, nain, task
4: systen
5:
6: systen, UCOP
7:
.(9:1) SI, set when the Dispatcher (and PSEUDOINT) should be aware of a pending eoft interrupt.
.(10:1) HK, hard kill pseudo interrupt
.(11:1) SK, soft kill pseudo interrupt
.(12:1) ST, stop pseudo interrupt
.(13:1) HB, hibernate pseudo interrupt
.(14:1) CY, control-y pseudo interrupt
.(15:1) BK, break pseudo interrupt

PCB10 .(0:15) EVENTFLAGS, one for each wait class in PCB04
.(15:1) WS, wake up waiting switch set if an awake ie nissing.

PCB11 .(0:32) LASTREFSWAPSEG, segment identifier of laet referenced swappable code segnent.

PCB13 (QUEUING INFO)
.(0:1) DISPQ ==> on dispatching queue
.(1:1) L scheduling clase
.(2:1) C scheduling class
.(3:1) D scheduling clase
.(4:1) E scheduling class
.(5:1) INTER ==> process is interactive
.(6:1) CORER ==> process is core resident
.(7:1) RSOFT, Allow soft interrupt. A value of 1 inplies that user soft interrupts will be processed. A zero value inhibits user soft ints (they are queued). This bit is nanaged by FINTSTATE and FINTEXIT intrinsics.
.(8:8) Process' echeduling priority

PCB14 .(0:16) PBX, CSTX block nap index of proceee' progran.

PCB15 .(0:16) MAPOST, OST entry number of the CST napping table.

PCB16 .(0:16) PIMPPIN, PCB relative index of previous inpeded PIH.

PCB17 .(0:16) NIMPPIN, PCB relative index of next inpeded PIN.

PCB18 .(0:16) BPTLINK, breakpoint link for process

PCB19 .(0:16) NQPTR, PCB relative index of next proc in disp queue

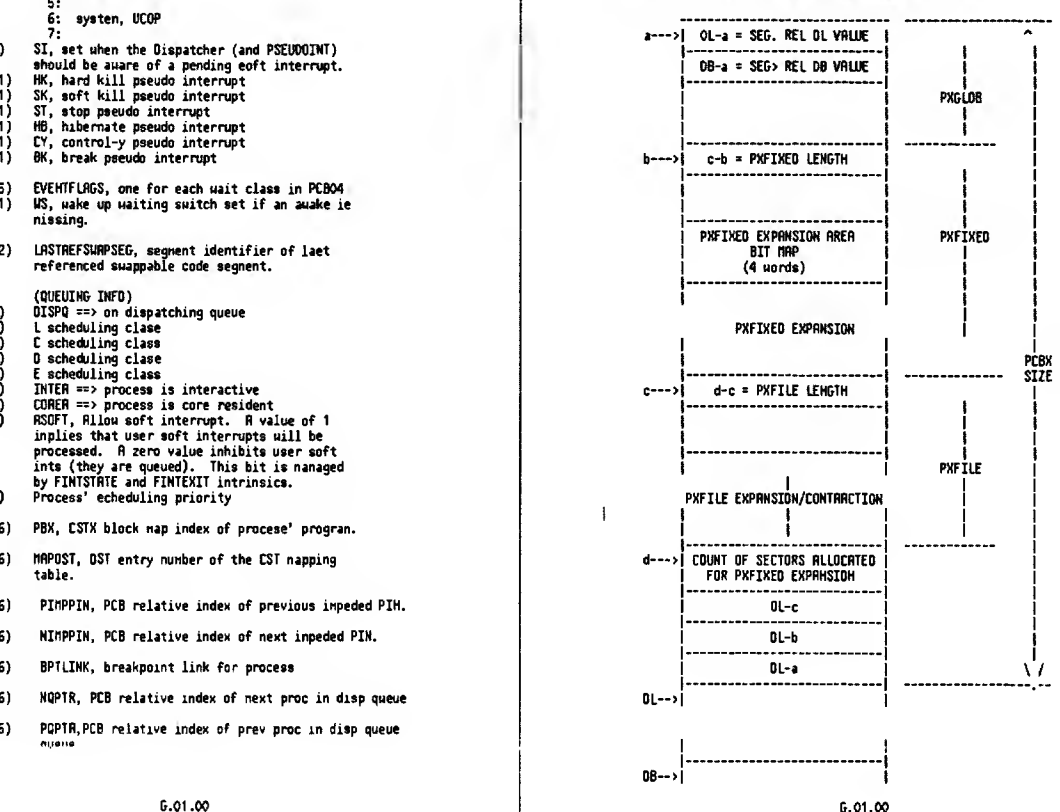
PCB20 .(0:16) PQPTR,PCB relative index of prev proc in disp queue





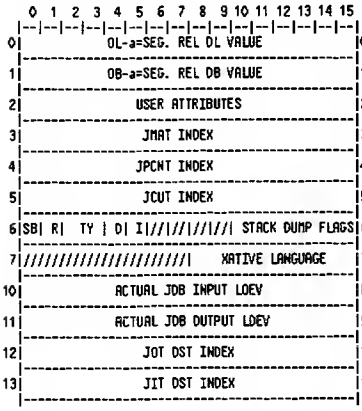
Process Control Block Extension (PCBX) Structure and Format

Process Control Block Extension (PCBX) General Structure



PXGLOB Format

The PXGLOB portion of the pcbx is for job information, and contains the same job related information for all processes belonging to the same job.




R = restart bit
I = job in/list interactive
D = job in/list duplicative
TY = job type
0 = undefined
1 = session
2 = job
3 = task
* = reserved:
SB= stun bit ;used for stack underflow simulation For ICF44 or ICF55.

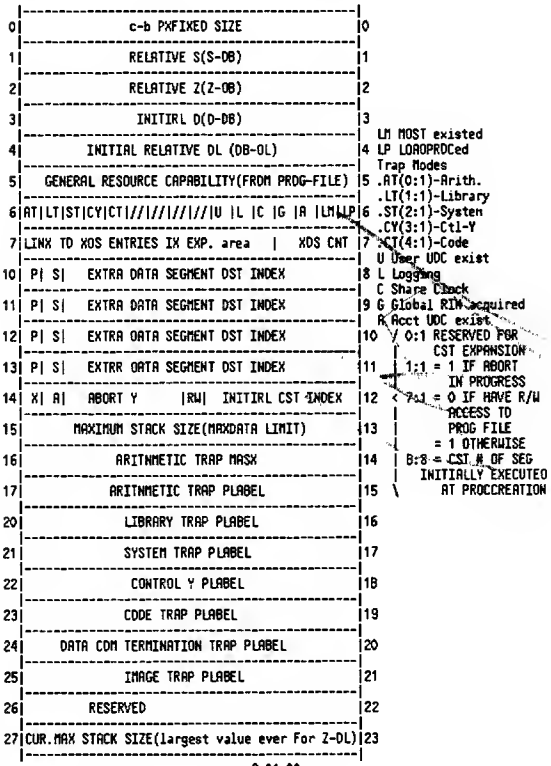
Stack Dump Flags
Bit 10 = Armed
Bit 11 = Suppress traceback
Bit 12 = Suppress RSCII
Bit 13 = Q-63 to S
Bit 14 = QINIT to S
Bit 15 = DL to QINIT





PXFIXED Assignments

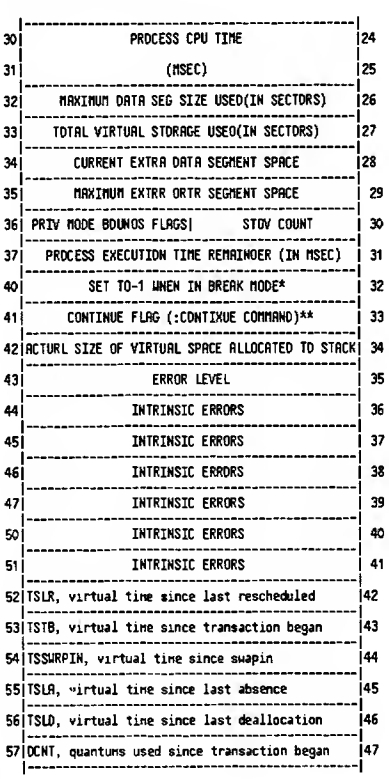
The PXFIXED portion of the pcbx contains specific information and control information.







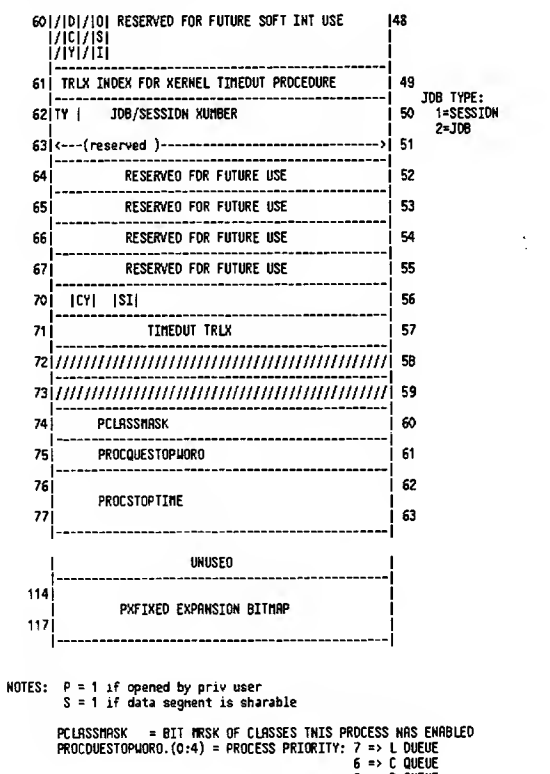

PXFIXED Assignments (Cont.)








PXFIXED Assignments (Cont.)




NOTES: P = 1 if opened by priv user
S = 1 if data segment is sharable

PCLASSMASK = BIT MASK OF CLASSES THIS PROCESS WAS ENABLED
PROCQUESTOPWORD.(0:4) = PROCESS PRIORITY: 7 => L QUEUE
6 => C QUEUE
2 => D QUEUE
1 => E QUEUE

```
                .(4:12)= REASON STOPPED: 1 => STOP SEG FAULT
                                         2 => STOP DISC WRIT
                                         3 => BLOCKED I/O, NON TERMINAL
                                         4 => TERMINAL READ
                                         5 => STOP IMPEDE
                                         6 => STOP ACTIVE
      PROCSTOPTIME = DBL WORD TIMESTAMP OF WHEN PROCESS STOPPED FOR
                     REASON GIVEN IN PROCQUESTOPWORD

      DCY            R DELAYED CONTROL Y IS PENDING (THIS BIT
                     IS CHECKED BY ININ ON BOUNDS VIOLATION TO
                     DETERMINE IF GOT:  1) TRUE BOUNDS VIOLATION
                     OR  2) AN INDUCED BOUNDS VIO THAT INDICATES
                     THAT THE CONTROL Y TRAP PROCEDURE MAY NOW
                     BE ENTERED).

      OSI            STATE OF THE "ASOFT" PCB BIT WHEN CONTROL Y
                     TRAP WAS ENTERED.  ASOFT = 1 ALLOWS USER SOFT
                     INTERRUPTS AGAINST THE PROCESS.  IT IS SET TO
                     ZERO WHEN THE CONTROL Y HANDLER IS ENTERED.
                     IT IS SET TO ITS PRIOR STATE WHEN THE USER
                     CALLS RESETCONTROL.
 * SET TO COMMAND RECORD LENGTH WHEN COMMAND PENDING
   (I.E. COMMAND ENTERED DURING BREAK OR ENCOUNTERED
   DURING FLUSHING).

** CONTINUE FLAG VALUES
     0 = NO CONTINUE IN EFFECT
     1 = CONTINUE JUST ENCOUNTERED
     2 = CONTINUE IN EFFECT FOR THIS COMMAND

CY FLAG

     PCBXFIXED(56).(1:1)    = SET BY PSEUDOINT WHEN THERE IS A PENDING
                              CONTROL Y WHICH CANNOT BE PROCESSED BECAUSE
                              OF SYSTEM CODE OR PRIVILEGED CODE.  ININ
                              CHECKS THIS BIT ON BOUNDS VIOLATION OR
                              TRACE TRAP.

SI FLAG

     PCBXFIXED(56).(3:1)    = SPECIFIES THE STATE OF THE USER INTERRUPT
                              FLAG WHEN THE CURRENT CONTROL Y WAS PROCESSED.
```





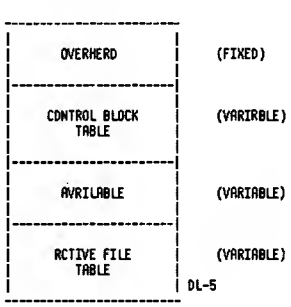
PXFIXED Expansion Bitmap

The PXFIXED bitmap and expansion area is for use in accounting of extra data segments acquired by the process.

File System Section of PCBX (PXFILE)

The PXFILE area is a subsection of the PCBX. It is a contiguous, expandable and contractible block of storage that is managed by the file system primarily for its own use. Other subsystems, namely CS and DS, also make use of the PXFILE section. In doing so they must conform to the conventions of the File system.

The overall structure of the PXFILE area is:

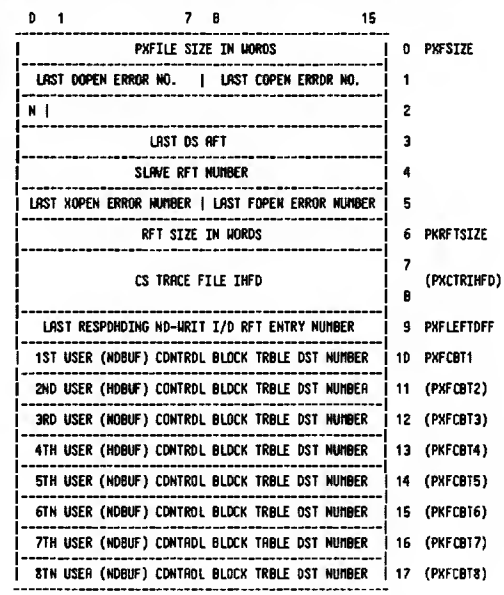







Overhead

The part labeled Overhead contains information that pertains to the entire section. It is addressed via the pointer at DL-3.




Partial word field identifiers are:

```
     PXFDOPEN     = PXFILE(1).(0:8)N,   last DOPEN error code
     PXFCOPEN     = PXFILE(1).(8:8)N,   last COPEN error code
     PXFNDCB      = PXFILE(2).(0:1)N,   no CB's in PXFILE CBT?
     PXFKDPEN     = PXFILE(5).(0:8)N,   last KOPEN error code
     PXFFDPEN     = PXFILE(5).(8:8)N,   last FOPEN error code
```





Discussion:

| | |
|---|---|
| PXFAFTSIZE | This is the size (in words) of the Active File Table (AFT). The size is in words to simplify calculating the size of the available block. |
| PXFCBT1-8 | These are the DST numbers of the user (NOBUF) control block tables. A DST number of 0 indicates that no data segment is allocated. |
| PXFCOPEN | This contains the last COPEN error number. Not used by the file system. |
| PXFCTRINFO | This contains information pertinent to the CS trace file. Not used by the file system. |
| PXFDOPEN | This contains the last DOPEN error number. Not used by the File system. |
| PXFDSINFO | Reserved for DS. Not used by the file system. |
| PXFFDPEN | This contains the last FOPEN error number. IF it is zero then the last FOPEN successfully completed; otherwise the last FOPEN was unsuccessful and the number is the file system error number. |
| PXFXOPEN | This contains the last XOPEN error number. KSAM is partly embedded in the File system, and an FOPEN Failure on a KSAM file can be caused by a Failure to open either the key file or the data File. This error number is used in conjunction with PXFFDPEN to determine which file caused the KSAM open failure. This error number is not used by the file system. |
| PXFLEFTOFF | This is the AFT entry number of the last File/line that completed a nowait I/O; if zero then no nowait I/O has been completed. This cell is maintained solely by and for the IDWRIT intrinsic. |
| PXFNDCB | This bit signifies that control blocks are not to be created in the PXFILE control block table. This bit is set by the NDCB parameter to the CREATE intrinsic or the :RUN command. This Feature permits the user to have as much stack space as possible; otherwise the file system will take several hundred words of stack for the PXFILE control block table. |
| PXFSIZE | This is the size (in words) of the complete PXFILE area. It is the sum of the overhead block, the control block table, the active File table and the available block. |

## PXFILE Control Block Table (PXFCBT)

Addressing within a PXFILE control block table is somewhat more complicated than addressing an extra data segment CBT since the table does not begin at DB+0. As a result all pointers within the table are table relative; the starting address of the table must be added to a pointer to generate a final DB-relative address. This addressing convention is consistently applied to all control block tables.

When the control block table is expanded, space is taken from the AVAILABLE area. If no space is available then the PXFILE area is expanded and the acquired space is added to the AVAILABLE area.

### Available Block

The part labeled Available is used to provide space when the Control Block Table or the Active File Table is expanded. These two tables grow towards each other, and when more space is needed it is simply taken from the Available Block.

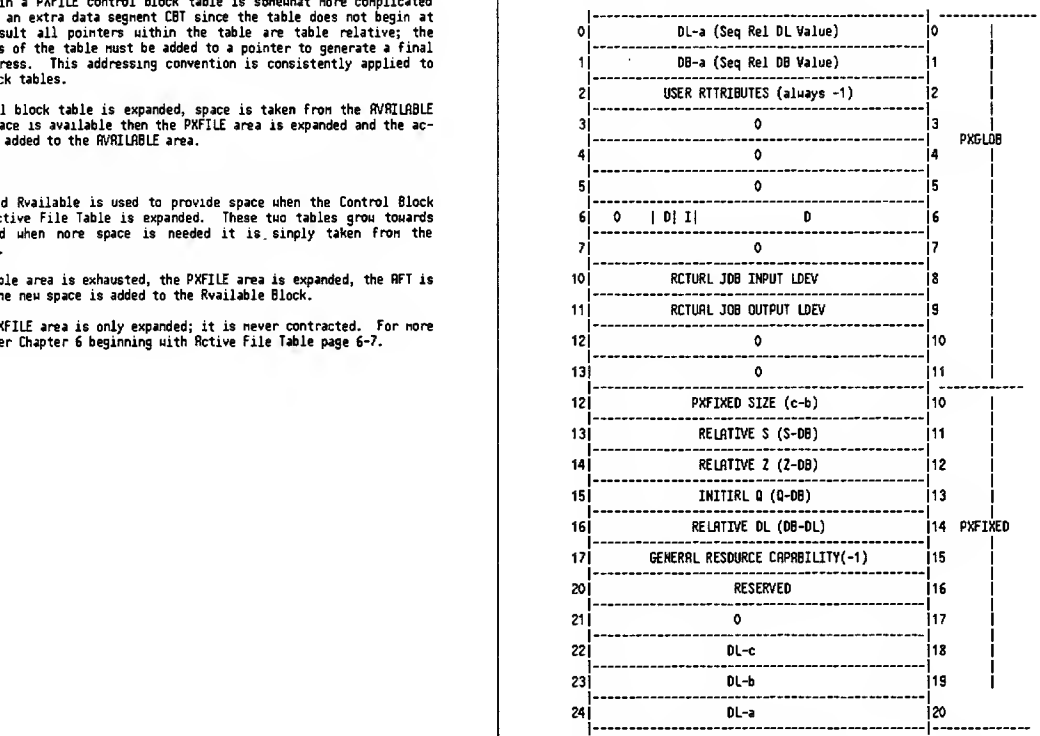
When the Available area is exhausted, the PXFILE area is expanded, the AFT is relocated and the new space is added to the Available Block.

Currently the PXFILE area is only expanded; it is never contracted. For more information refer Chapter 6 beginning with Active File Table page 6-7.





## PCBX For Core Resident System Process Stacks




NOTES: 1. There is no PXFILE area.
2. The PXFIXED area is much smaller than a normal PCBX.

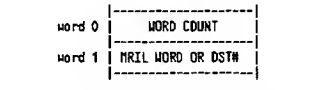




## Process To Process Communication Table

This table is used as the communication link by which father and son processes communicate with one another via the mailbox scheme. This table contains two words per entry and is indexed by PCB# (entry index 0 is meaningless). Each two word entry of index N essentially relates where, as well as how much, mail may be found for a process N with respect to communications between N and his father process.

ENTRY FORMAT



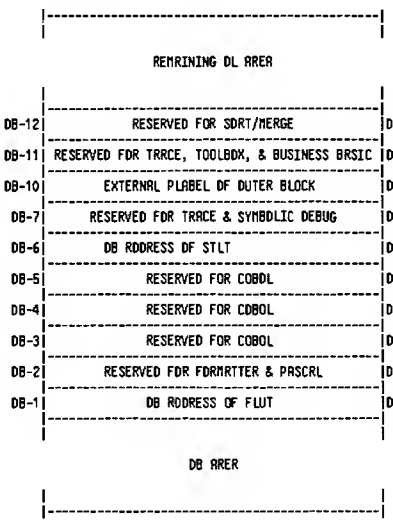

where word 0 = the # of mail words to be transferred.
word 1 = the only word of mail itself if word 0 = 1
otherwise
it contains the DST# of the extra data segment where "word count" words of mail exist.

NOTE: Assume process S is the son of process F. Then the process to process communication table index which will be used for mailbox communication between son S and father F will be that of the son (i.e. S).





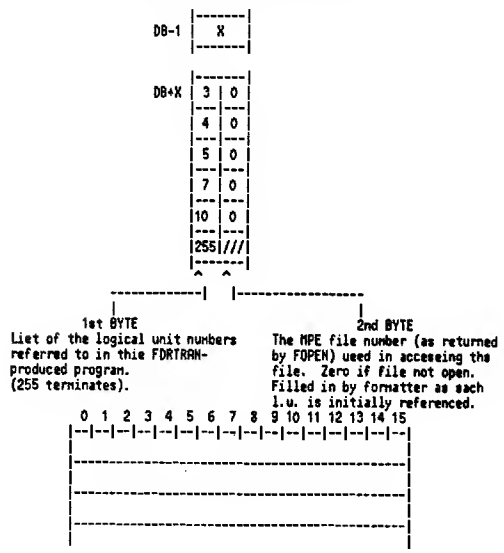
## Subsystem Reserved DL Area



FORTRAN Logical Unit Table (FLUT)

The segmenter is responsible for the preparation and initialization of a FORTRAN logical unit table. This is done when a program is prepared if that program contains at least one program unit that references a logical unit. The location of the FLUT is in the secondary DB area and the address of this location is contained in DB-1.

The FLUT is formatted as per the following example:



# CHAPTER 8 JOB TABLES

## Job Tables Overview

Job Master Table (JMAT): One entry per job/session. Contains information needed to get the job/session running. Entry is created at the introduction of job/session.

Job Information Table (JIT): One DST per job/session. Contains information needed by the job/session as it is executing.

Process Job Cross Reference Table (PJXREF): One DST per system. Used to determine the job/session main process (command interpreter) for any process on the system.

Job Process Count Table (JPCNT): One entry per job/session. Entry number used to index into the JIR to lock job resources.

Job Directory Table (JDT): One DST per job/session. Contains the following sub-tables used by descendants of job/session. Must obtain JIR (by using JPCNT index) before accessing JDT. Sub-tables:

1. Data Segment Directory - Directory of sharable DSTs used by job/session
2. Temporary File Directory
3. File Equation Table
4. Line Equation Table
5. Job Control Word Table

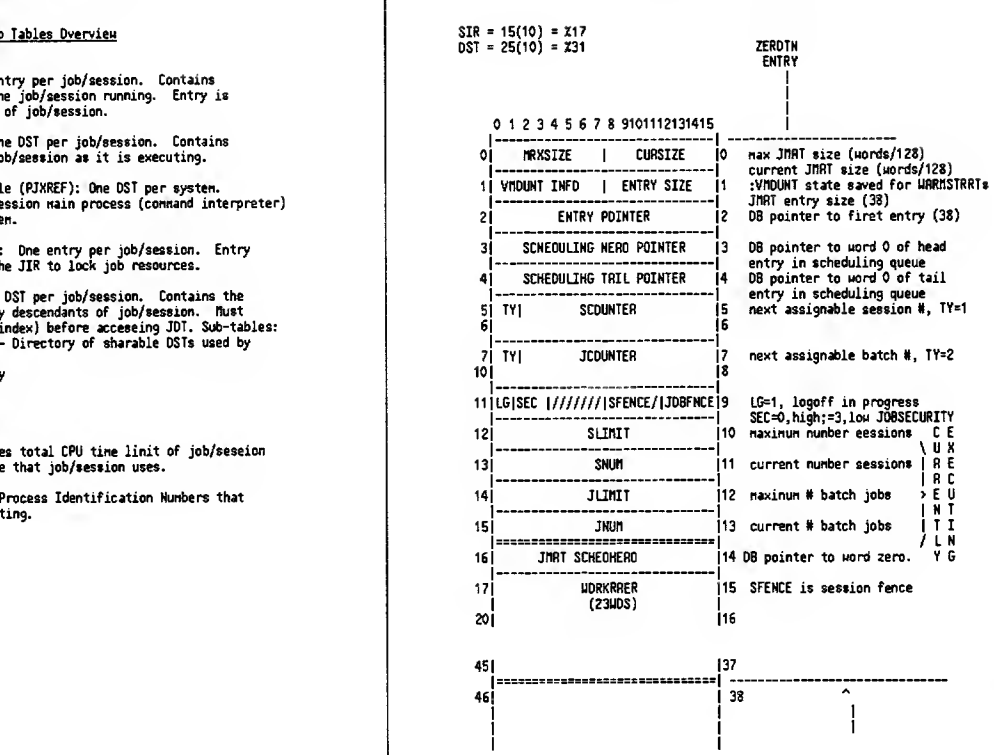
Job Cut-off Table (JCUT): Stores total CPU time limit of job/seseion and accumulates the CPU time that job/session uses.

Ucop Request Queue: A queue of Process Identification Numbers that are terminating.





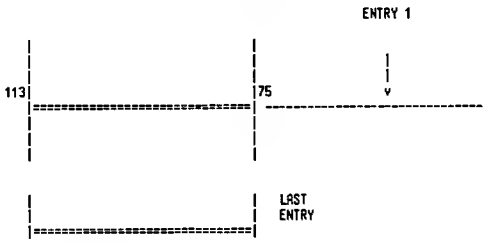
## Job Master Table Structure (JMAT)








## JMAT (Cont.)




SCHEDULING QUEUE

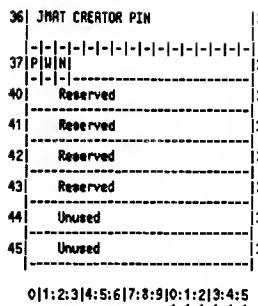
WAITING SESSIONS
FIFO WITHIN MIPRI/INPUT PRIORITY
[ERROR JOBS ]
[ FIFO ]
WAITING JOBS
FIFO WITHIN MIPRI/INPUT PRIORITY





## Job Master Table Entry (JMAT)

JMAT (Cont.)




Used with the programmatic creation of sessions.

P=Programmatic logon
W=WAITTILLON
N=NOWAIT

R = RESTART
N = SEQUENCED
S = ORIGJIN is spooled.

FT = funny terminal
00 - regular term.
01 - regular term., special logon
10 - RPL term.
11 - APL term.





Job States

JOB STATES - JMAT ENTRY WORD 0.(0:6)

SHOWJOB - Displays job states by scanning JMAT DST (X31)

LOGON USES ALL STATES EXCEPT "SUSPEND"

| STATE NO. | STATE NAME | PROCESS | SEGMENT | PROCEDURE(S) |
|---|---|---|---|---|
| 1 | INTRO | DEVREC<br>JSMP<br>SPOOLER | NURSERY | STARTDEVICE ->PUTJMAT ->ALLOCENTRY IN SEGMENT ALLOCUTIL |
| %70 | SCHED | UCOP | JOBSCHED | CXSTSTREAM SCHEDULEOSCHED |
| %40 | WAIT | DEVREC<br>JSMP<br>SPOOLER | NURSERY<br>\<br>SPOOLING<br>/ | STARTDEVICE ->SCHEDULEJOB<br>SPOOLSTUFFIN ->SCHEDULEJOB |
| %60 | INIT-IALIZRT-ION | UCOP | UCOP | LAUNCHJOB |
| 2 | EXEC | JSMP | NURSERY | INITJSMP |
| 3 | TERMIN-ATING | JSMP | MORGUE | TERMINATE ->EXPIRE -> CLEANUPJOB |
| 0 | FREE ENTRY | JSMP | MORGUE | TERMINATE ->EXPIRE -> CLEANUPJOB ->DERLLOCENTRY IN ALLOCUTIL |
| 4 | SUSP | JSMP | OPLOW | CXBREAKJOB |

For states INTRO and WAIT,

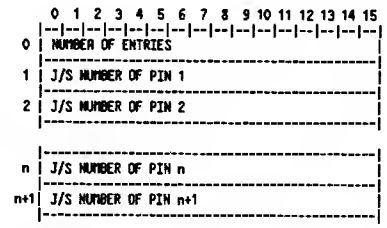
DEVREC => logon command originated on terminal or other unspooled device.
SPOOLER => logon command originated on spooled device.
JSMP => logon command is the result of the execution of a :STREAM command. (This also includes USER processes which have done programmatic :STREAMs.)





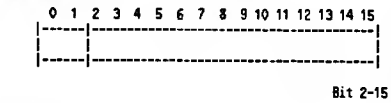
Process Job Cross Reference Table (PJXREF)

DST = %62
TABLESIZE = NPCB entries + 1




This table is only used by the SHOWQ command. The entries in the table are set up through PROCREATE and modified by MORGUE.

The job/session number is in the format:




00 = Unused/undefined
01 = Session
10 = Job
11 = Unused/undefined
Bit 2-15 = Job/session Number

A completely zero entry is either from a system process or a currently unused pin.





Job Process Count Table (JPCNT)

(1 Bit Entry/Running Job )

MEMORY RESIDENT
SYSGLOB BASE = 0B+13(X15)
DST = 24(10)
SIR = 13(10)




free entry = 1
allocated entry = 0

A JPCNT entry must be allocated before the main process can be procreated. The JPCNT Index is located in word 4, PXGLOBAL area, of the stack of a job or session. One JPCNT Index is allocated per job or session.

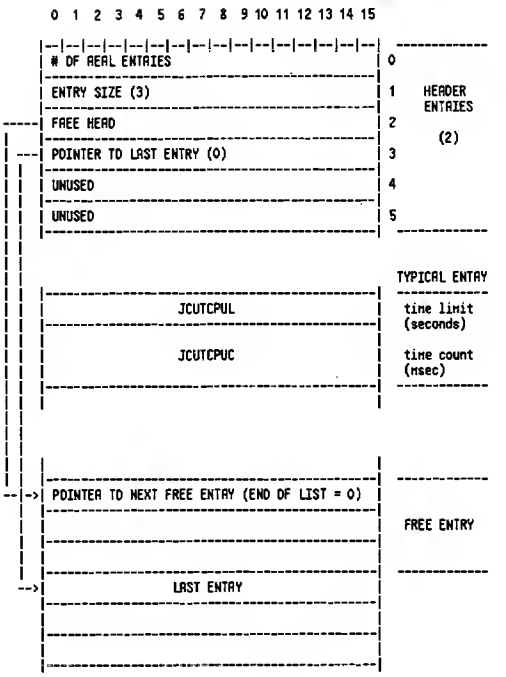
The job SIR (JIR) = base+JPCNT index, where base is the number of system reserved SIRs. The JIR is used to lock the Job Directory Table.

NOTE: This table is completely bit oriented with each entry consisting of one bit. Entries are taken from available pool on a "first found" basis. A "1" found in the bit map indicates a free entry. A zero (0) found in the bit map indicates an allocated entry. Word 2 of this table is the index of the word in the Bit Map where the next free entry resides. At system start up, this word is set to zero (0). The Bit Map can be thought of as ranging from 0-63 (64 total words - 1024 entries).

## Job Cutoff Table (JCUT)
1 Entry/ CPU-limited Job

MEMORY RESIDENT

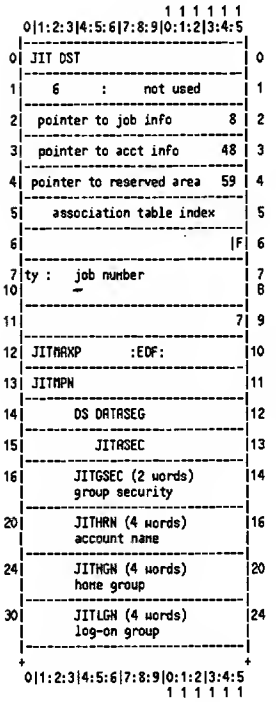
SYSGLOB BASE = DB+11(%13)
DST = 36(10);SIR = 14(10)
SYSGLOB + %117 = default
CPU time limit for jobs








## Job Information Table (JIT)
JIT DST is word 11 (base 10) in PXGLOB




F - Job/Session-wide FPMAP option flag (JSFPMAP)

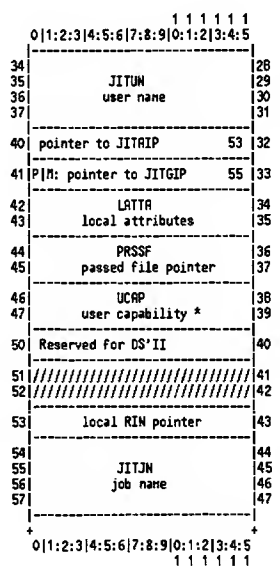
ty - 1 = Session
2 = Job

JITMAXP - MAXJOBPRI capability
JITMPN - Job main PIN.
JITEOF - used by FCLOSE to tell CI that a $STDIN(X) file was closed w/out encountering an EOF. (0:1)=$STDIN, (1:1)=$STDINX
JITASEC=Account Security





## JIT (Cont.)

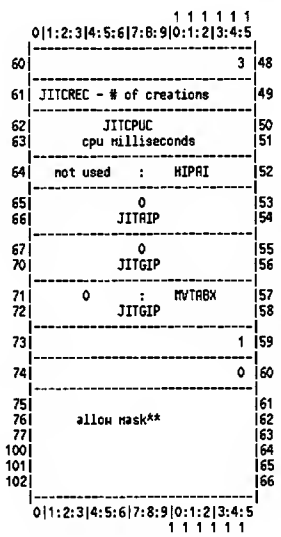



P - Group's home volume is a private volume
M - Private volume mounted (i.e. group bound to home volume set), JITGIP = 57

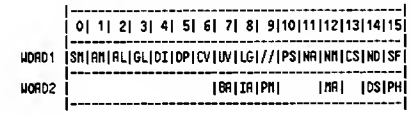




## JIT (Cont.)




* THE FORMAT FOR UCAP (X46-47) IS AS FOLLOWS:



## Allow Mask Format

** The Allow mask for MPE V is expanded to six words. There is a mask in each user's JIT and the global allow mask in the SYSGLOB extension area. The Allow mask contains enough bits for a one-to-one correspondence to every present OPERATOR type command, or any future OPERATOR command. When a user is ALLOWed any OPERATOR command or ASSOCIATEd to a device (which will use OPERATOR type commands) then the corresponding bit(s) in the mask in that user's JIT for that command is set. If the ALLOW or ASSOCIATE was done on a global scale, then the bit(s) in the mask of the SYSGLOB area is/are updated.

The following EQUATEs define the mask bit for each operator command.

The first set of commands define the operator commands dealing with devices.

When adding a new command to this set of EQUATEs, be sure to add a corresponding move statement in LOGIMAGE, even if the command will not be logged.

| | Word | Bit | # |
|---|---|---|---|
| ABORTIO | 0 | 0 | 0 |
| ACCEPT | 0 | 1 | 1 |
| DOWN | 0 | 2 | 2 |
| GIVE | 0 | 3 | 3 |
| HEADOFF | 0 | 4 | 4 |
| HEADON | 0 | 5 | 5 |
| REFUSE | 0 | 6 | 6 |
| REPLY | 0 | 7 | 7 |
| STARTSPOOL | 0 | 8 | 8 |
| TAKE | 0 | 9 | 9 |
| UP | 0 | 10 | 10 |
| MPLINE | 0 | 11 | 11 |
| OSCONTROL | 0 | 12 | 12 |
| UPPER LIMIT->DEVICE COMMANDS | | | |
| ABORTJOB | 0 | 13 | 13 |
| ALLOW | 0 | 14 | 14 |
| ALTFILE | 0 | 15 | 15 |
| ALTJOB | 1 | 0 | 16 |
| BREAKJOB | 1 | 1 | 17 |
| DELETE | 1 | 2 | 18 |
| DISALLOW | 1 | 3 | 19 |
| JOBFENCE | 1 | 4 | 20 |
| LIMIT | 1 | 5 | 21 |
| STOPSPOOL | 1 | 6 | 22 |
| SUSPENDSPOOL | 1 | 7 | 23 |
| OUTFENCE | 1 | 8 | 24 |
| RECALL | 1 | 9 | 25 |



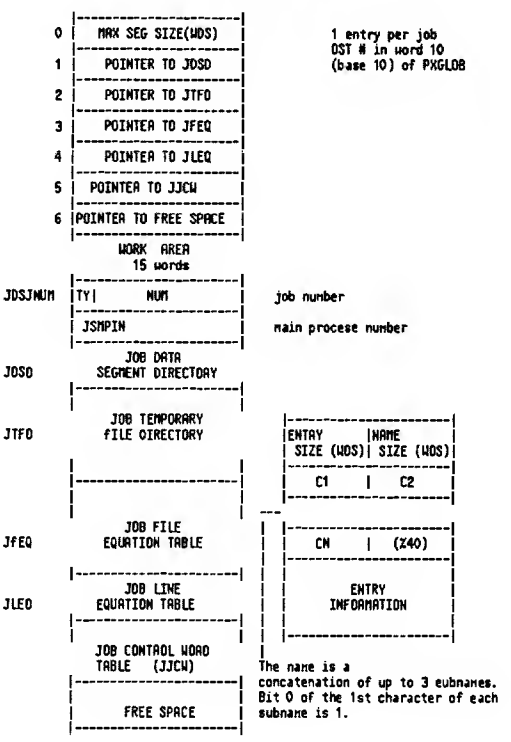


| | Word | Bit | # |
|---|---|---|---|
| RESUMEJOB | 1 | 10 | 26 |
| RESUMESPOOL | 1 | 11 | 27 |
| STREAMS | 1 | 12 | 28 |
| CONSOLE | 1 | 13 | 29 |
| WARN | 1 | 14 | 30 |
| WELCOME | 1 | 15 | 31 |
| MON | 2 | 0 | 32 |
| MOFF | 2 | 1 | 33 |
| VMOUNT | 2 | 2 | 34 |
| LMOUNT | 2 | 3 | 35 |
| LOISMOUNT | 2 | 4 | 36 |
| MRJECONTROL | 2 | 5 | 37 |
| JOBSECURITY | 2 | 6 | 38 |
| DOWNLOAD | 2 | 7 | 39 |
| MIOENABLE | 2 | 8 | 40 |
| MIODISABLE | 2 | 9 | 41 |
| LOG | 2 | 10 | 42 |
| FOREIGN | 2 | 11 | 43 |
| INF | 2 | 12 | 44 |
| SHOWCOM | 2 | 13 | 45 |
| OPENQ | 2 | 14 | 46 |
| SHUTQ | 2 | 15 | 47 |
| DISCAPS | 3 | 2 | 48 |





## Job Directory Table (JOT)

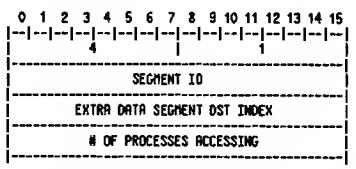






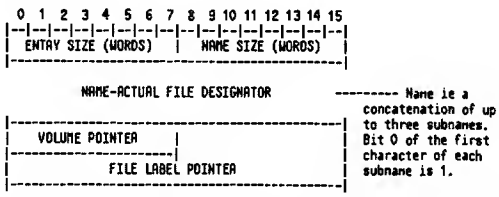

## Job Data Segment Directory Entry (In JDT)

If a DST is allocated as sharable, then it will have entries in both the JDT and PXFIX. Sharable means that it can be be shared by all processes in the Command Interpreter process tree (sons, etc.). Nonsharable DSTs only have entries in the PXFIXED.



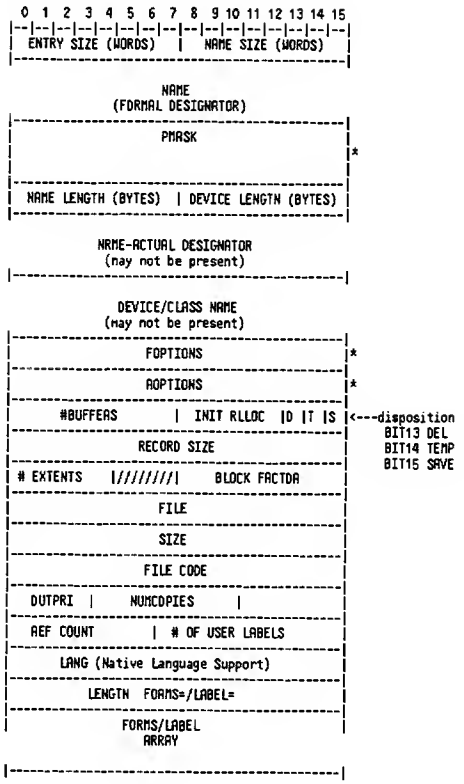

NOTE: A return of %2004 in the INDEX value after using the GETDSEG intrinsic indicates that there is no more room in the Job Directory Table for another job sharable data segment.

## Job Temporary file Entry (In JDT)




Since all son processes of a CI share the same JDT, exclusive access of the JDT is controlled with the Job SIA (JIR) and is locked and unlocked by calls to LOCKJIA and UNLOCKJIA. The JIA number is found in the PXGLOBAL area (JPCOUNT index). Only job and sessions traces have JIAs, system processes do not, even though they have JDTs. The JDTs were provided for system processes for consistency, but are not meant to be increased or reduced.

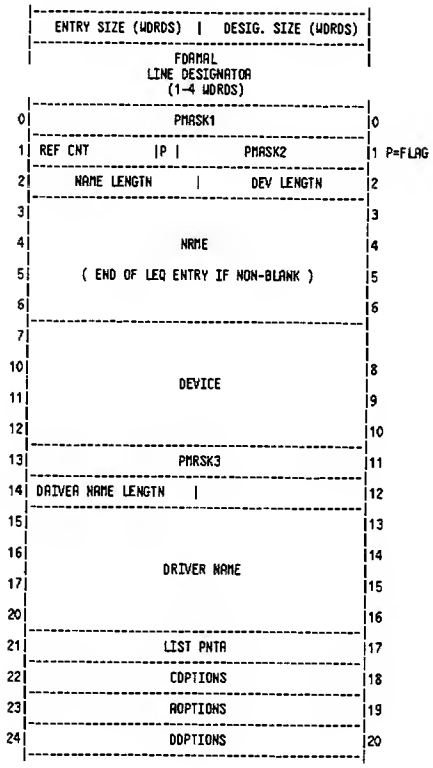
File Equation Table Entry (In JDT)







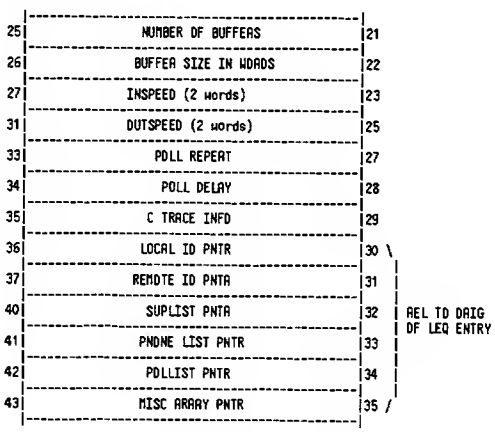

Job Line Equation (JLEQ) Entry



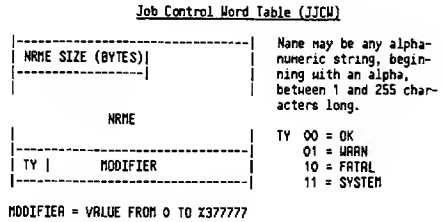





JLEQ Entry (Cont.)




Job Control Word Table (JJCW)




Name may be any alpha-numeric string, beginning with an alpha, between 1 and 255 characters long.

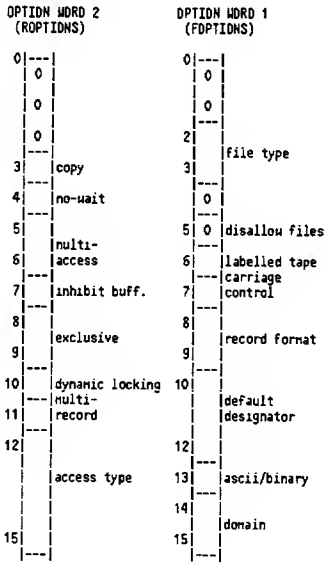
TY 00 = OK
01 = WARN
10 = FATAL
11 = SYSTEM

MODIFIER = VALUE FROM 0 TO %377777

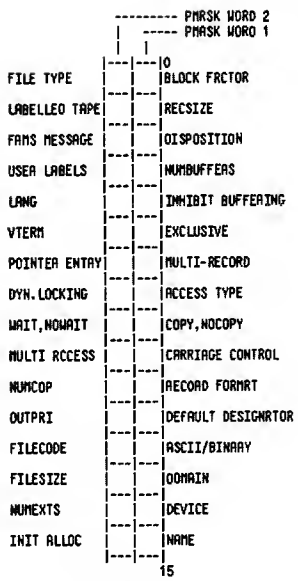




Aoptions and Foptions Word Breakdown



PMRSK Word Breakdown




1->info present
0->info abeent

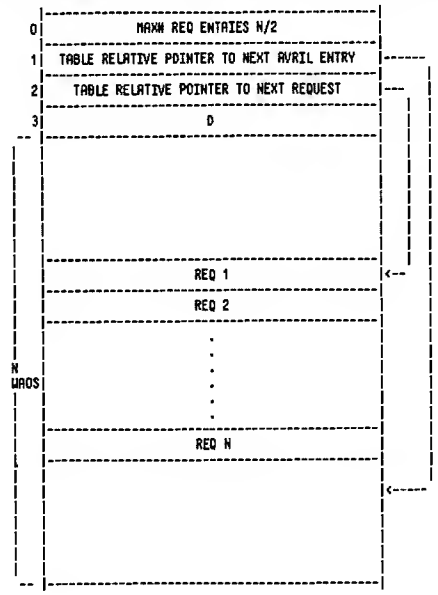




UCOP Request Queue (DST#9)

The UCOP Request Queue (URQ) ie ueed to to eignal UCOP that a proceee ie requeeting proceee deletion. The URQ is a circular queue using a FIFO algorithn to proceee requeste. When the next available pointer ie equal to the next requeet pointer, then the table ie empty. When the next available pointer ie (logically) one lese than the next request pointer and the request ie entered, then the table ie full. R full table will cauee Syeten Failure 1 (SF1). Thue, the laet (logical) entry cannot be used. An entry is added via a call to REQUCOP.

The UCOP Request Queue (MPE IV) wae previouely used for many functione such ae etack expansion, but those functions moved to other areas with MPE V. The only valid entry now ie a type 2 entry (proceee deletion). The original format ie retained in the event that nore functions are added.

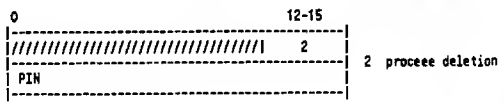







UCOP Entry Format

Each entry ie
2 worde long

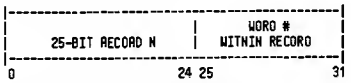



2 proceee deletion

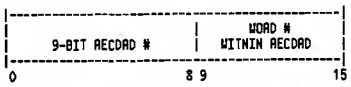
## CHAPTER 9 RELOCATABLE OBJECT CODE

### USL Files Introduction

* USL record length 128 words always.
* Layout of doubleword disc addresses




* Hash links join all entries with the same hash key regardless of type.
* Linear lists terminate with a zero link
* Circular lists containing only the list head point directly to themselves.
* Single-word disc addresses




Uninitialized fields are reserved for future use and should be set to zero.

### Record 0 and Overall USL File Format

| | | | |
|---|---|---|---|
| 0 | LIO | 0 | LOADER ID |
| 1 | NE | 1 | NR. DIRECTORY ENTRIES |
| 2 | OL | 2 | DIR. LENGTH |
| 3 | SUMDG | 3 | TOTRL DIR. GARBAGE |
| 4 | NDG | 4 | NR. DIR. GARB. ENTRIES |
| 5 | SRBDL | 5 | S.R. BLOCK DRTR LIST |
| 6 | SRIPL | 6 | S.A. INTERRUPT PROC. LIST |
| 7 | SASL | 7 | S.A. SEGMENT LIST |
| 10 | FL | 8 | FILE LENGTH |
| 11 | | 9 | |

NOTE:
S.A. = Starting Address





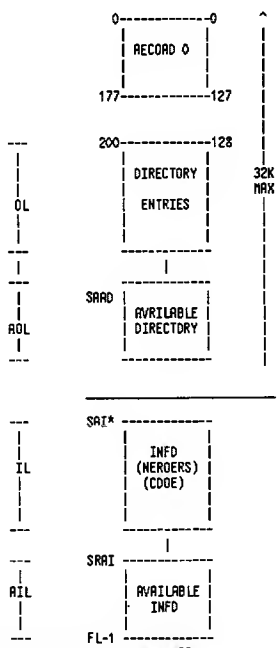
### USL File Format (Cont.)

| | | | |
|---|---|---|---|
| 12 | SRAO | 10 | S.R. AVRIL. DIR. |
| 13 | ADL | 11 | AVAIL. DIR. LENGTH |
| 14 | SAI | 12 | S.A. INFO BLOCK |
| 15 | | 13 | |
| 16 | IL | 14 | INFO BLOCK LENGTH |
| 17 | | 15 | |
| 20 | SRRI | 16 | S.R. AVAIL. INFO |
| 21 | | 17 | |
| 22 | AIL | 18 | AVAIL. INFO LENGTH |
| 23 | | 19 | |
| 24 | TOTRL | 20 | TOTRL INFO GARBAGE |
| 25 | I.G. | 21 | |
| 26 | NIG | 22 | NR. INFO GARB. ENTRIES |
| 27 | | 23 | |
| 30 | | 24 | |
| 31 | | 25 | |
| 32 | | 26 | |
| 33 | | 27 | |
| 34 | | 28 | |
| 35 | | 29 | |
| 36 | | 30 | |
| 37 | | 31 | |
| 40 | | 32 | |
| 41 | NL = 0 | 33 | HASH LINKS |
| | . | | |
| | . | | |
| 177 | NL = 94 | 127 | |





### USL Files General Information (Cont.)



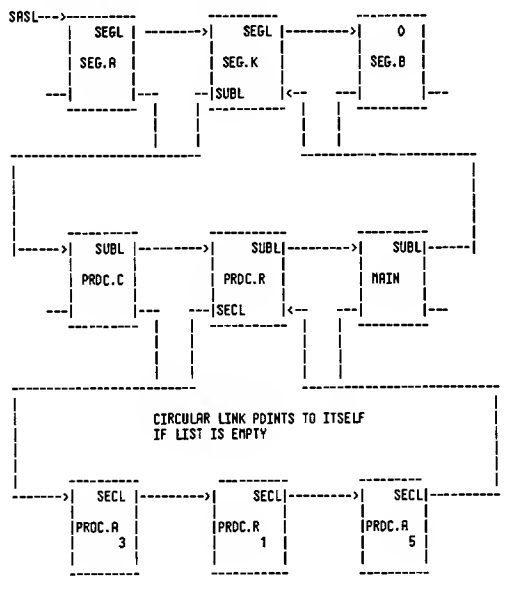

*SAI MUST BE ON R RECORD BOUNDRY

NOTE: ALL ADDRESSES IN RECORD 0 ARE WORD ADDRESSES.





### USL Files General Information (Cont.)

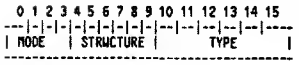



A K B >SEGMENT NAME ENTRIES

PROC C PROC A MAIN >SUBPROGRAM / ENTRIES

A 3 R 1 A 5 } SECONDARY ENTRY POINT ENTRIES

Data Deecriptors, Passed Paraneters




| TYPE | WORDS | CODE |
|---|---|---|
| NULL | | 0 |
| LOGICAL | 1 | 1 |
| INTEGER | 1 | 2 |
| BYTE | 1/2 | 3 |
| REAL | 2 | 4 |
| DOUBLE | 2 | 5 |
| LONG | 3 | 6 |
| COMPLEX | 4 | 7 |
| LABEL (SPL) | | 10 |
| CHARACTER (STRING) | N/2 | 11 |
| LABEL (FORTRAN) | | 12 |
| UNIVERSAL (MATCHES ANY TYPE) | | 13 |

STRUCTURE

| | |
|---|---|
| SIMPLE VARIABLE | 0 |
| POINTER | 1 |
| ARRAY | 2 |
| PROCEDURE | 3 |

MODE

| | |
|---|---|
| NULL | 0 |
| VALUE | 1 |
| REFERENCE | 2 |
| NAME | 3 |

NOTE: R descriptor of 0 results in an automatic match.

Pascal

Pascal sets the high order bit in the parameter type descriptor when it is generating hashed values. The remaining 15 bits are based on a hash of the types of the parameter. Only the Pascal compiler can compute the value, and the SEGMENTER must match the whole 16 bit value.





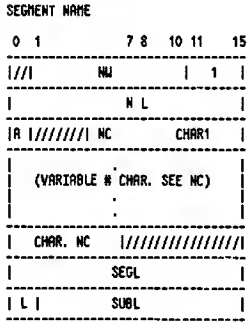
Entry Type 0

GARBAGE


NW - Number of words in this block

Entry Type 1

SEGMENT NAME




NW - Number of words in entry block

HL - Hash link - points to next entry having the same hash code

R - Activity bit
0 if active
1 if inactive
(initialize to 0)

Note: An inactive segment implies that all entry points are inactive

NC - Number of characters in name. Max is 16

CHAR. 1 - First character in variable field
CHAR. NC - Last character in variable field
SEGL - Segment link - points to next segment name entry
SUBL - Subprogram link - points to next entry having the same segment name
L - Last entry in list
0 if not last
1 if last





Clarification Notes on Entry Types 2 and 4
With Respect to SPL and FORTRAN

| *ENTRY TYPE 2 SPL D.B. | **ENTRY TYPE 4 SPL PROC | *ENTRY TYPE 2 FORTRAN MAIN | **ENTRY TYPE 4 FORTRAN SUB. |
|---|---|---|---|
| TPDB | 0 | 0 | 0 |
| 1,5 TSDB | 1 TSDB | 1,2,3,4 TSDB | 1,2,3,4 TSDB |
| NWPUST | NWPUST | NWPUST | NWPUST |
| 5 NWSDB | NWD | NWD | NWD |

WHERE: TPDB = Total primary DB length in words
TSDB = Total secondary DB length in words
NWPUST = Number of words in "TRACE" array
NWSDB = Number of words in secondary DB array
NWD = Number of words in own array
NWO = Number of words in data array

Notes: 1. Does not include the length of the STLT
2. Does not include the length of the FLUT
3. Does not include the length of any common array
4. Includes the length of any DB-allocated format array
5. Are not necessarily equal

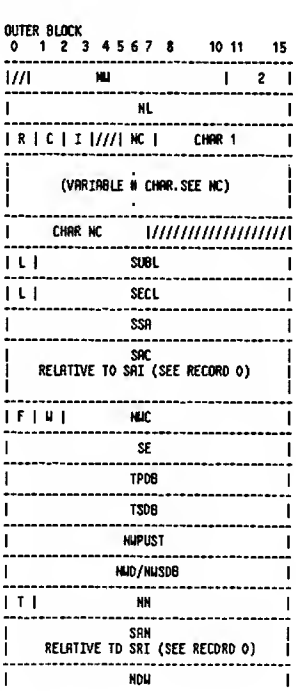
In general TPDB and TSDB are summations of storage allocated in the global area of the program's data segment. They are not, however, complete since the compilers are not aware of all storage actually allocated! The STLT and FLUT are examples of this since these tables are constructed by the segmenter. Common arrays also present a problem since their inclusion in TPDB and TSDB might cause their storage requirements to be counted more than once.



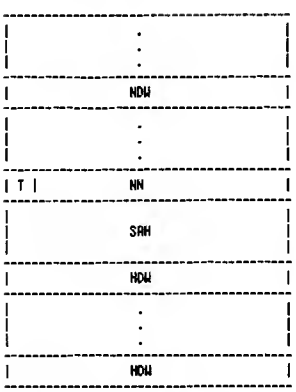


Entry Type 2

OUTER BLOCK



Entry Type 2 (Cont.)




NW - Number of words in entry block.

NL - Nash link - points to next entry with same hash code.

A - Activity bit. 0 if active, 1 if inactive outer block.

C - Callability bit set if entry point is uncallable.

I - Privilege mode bit - set if program unit is to be executed in Privilege mode..

NC - Number of characters in name. Max is 16.

CHAR. 1 - first character in variable field.

CNAR. NC - Last character in variable field.

L - Last entry in list.
0 if not last
1 if last





Entry Type 2 (Cont.)

SUBL - Subprogran link - points to next entry Entry having the sane segnent nane.

SECL - Secondary entry point list link.

SSA - Program unit starting PB address.

SRC - Starting 8FILE9 address of code module

f - Set if fatal error

W - Set if nonfatal error

NWC - Number of words in code module.

SE - Stack size estimate

TPDB - Total nunber of words of prinary DB to be allocated

TSDB - Total nunber of words of secondary DB to be allocated.

NWPUST - Nunber of words in trace array (PUST)

NWD - Nunber of words in data array (FORTRAN)

NWSDB - Nunber of words in secondary DB array (SPL)

T - Terminating bit - set if last set of headers in entry

NN - Nunber of headers

SRN - Starting address of header (relative to SRI)

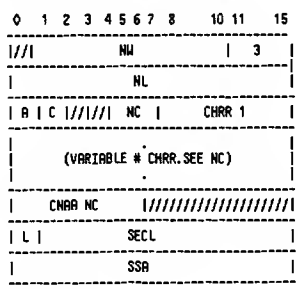
HDW - Neader (pointer)





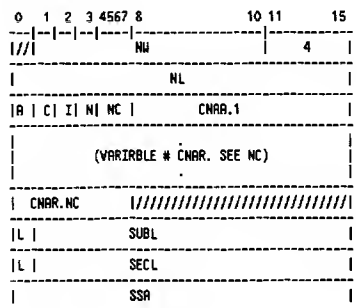
Entry Type 3

OUTER BLOCK - SECONDARY ENTRY POINT




Entry Type 4

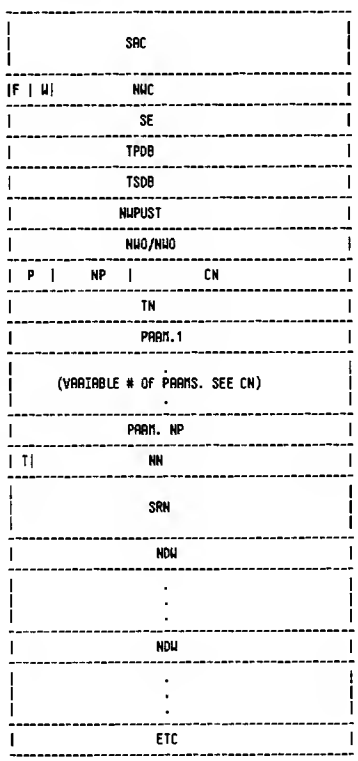
PROCEDURE








Entry Type 4 (Cont.)



Entry Type 4 (Cont.)

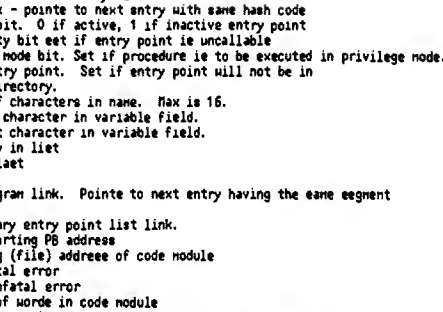
NW - Number of words in entry block
HL - Hash link - pointe to next entry with same hash code
A - Activity bit. 0 if active, 1 if inactive entry point
C - Callability bit set if entry point ie uncallable
I - Privilege mode bit. Set if procedure ie to be executed in privilege mode.
H - Hidden entry point. Set if entry point will not be in library directory.
NC - Number of characters in name. Max is 16.
CHAR1 - first character in variable field.
CHAR NC - Last character in variable field.
L - Last entry in list
0 if not last
1 if last
SUBL - Subprogram link. Pointe to next entry having the same segment Name
SECL - Secondary entry point list link.
SSA - Unit starting PB address
SRC - Starting (file) address of code module
F - Set if fatal error
W - Set if nonfatal error
NWC - Number of words in code module
SE - Stack size estimate
TPDB - Total number of words of primary DB to be allocated.
TSDB - Total number of words of secondary DB to be allocated.
NUPUST - Number of words in trace array (PUST)
NWD - Number of words in data array (FORTRAN)
NWD - Number of words in own array (SPL)
P - Parameter checker
00 no checking. (Impliss NP undefined, FN and PARM's absent)
01 check procedure type. (Impliee NP is undefined and PARM's absent)
10 check procedure type and number of PARM's (impliee PARM's absent)
11 check procedure type, number of PARM 's and type of each PARM.
NP - Number of PARM's
CH - Character count of PARM's
TH - Terminating bit. Set if last set of headers in entry.
NH - Number of headers
SRH - Starting address of header
HDW - Header (pointer)





Entry Type 5

PROCEDURE - SECONDARY ENTRY POINT




NW - Number of words in entry block

HL - Hash link - pointe to next entry with same hash code

A - Activity bit. 0 if active, 1 if inactive entry point

C - Callability bit set if entry point is uncallable.

H - Hidden entry point set if entry point will not be in library directory

NC - number of characters in name, max ie 16

CHAR 1 - First character in variable field.

L - Last entry in list
0 if not last
1 if last

SECL - Secondary entry point list link

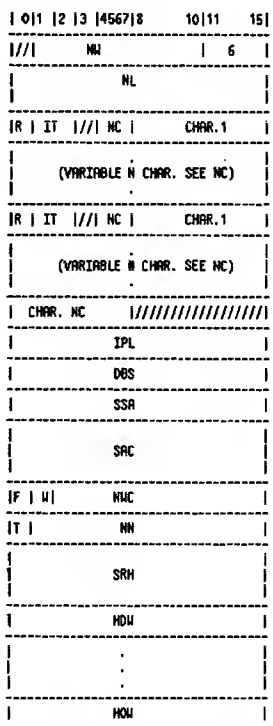
SSR - Unit starting PB' address





Entry Type 6

INTERRUPT PROCEDURE








Entry Type 6 (Cont.)

NW - Number of words in entry block

HL - Hash link. Pointe to next entry with same hash code

A - Activity bit. 0 if active, 1 if inactive entry.

IT - Interrupt procedure type number

NC - Number of characters in name (maximum is 16)

CHAR 1 - First character in variable field.

CHAR NC- Last Character in variable field

IPL - Interrupt procedure link

DBS - Number of words of DB storage required.

SSA - Unit starting PB' address

SRC - Starting (file) address of code module.

F - Set if fatal error

W - Set if nonfatal error

NWC - Number of words in code module

T - Terminating bit. Set if last set of headers in entry.

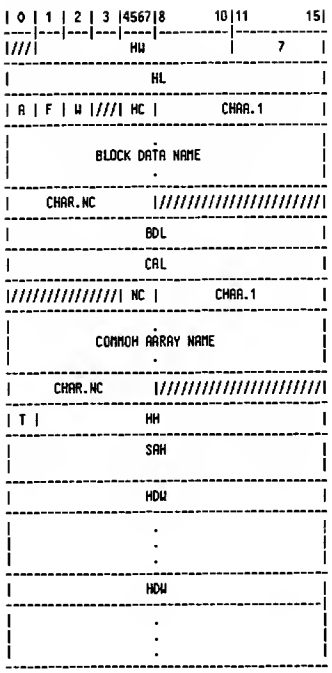
NH - Number of headers

SRH - Starting address of header.

HDW - Header (pointer)

Entry Type 7

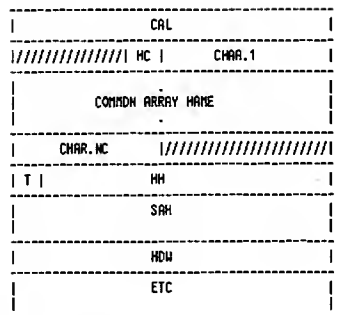
BLOCK DATA








Entry Type 7 (Cont.)




NW Number of words in block

HL - Hash link. Points to next entry with same hash code.

A - Activity bit. 0 if active, 1 if inactive block.

F - Set if fatal error.

W - Set if nonfatal error.

CHAR 1- First character in variable Field.

CHAR NC-Last character in variable field.

BDL - Block data link

CAL - Common array length

T - Terminating bit. Set if last set of headers in entry.

HH - Number of headers.

SAH - Starting address of headers.

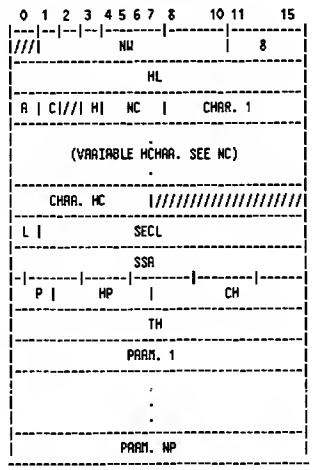
HDW - Header (pointer)





Entry Type 8

PROCEDURE - SECONDARY ENTRY POINT




NW - NUMBER OF WORDS IN ENTRY BLOCK

HL - HASH LINK - POINTS TO NEXT ENTRY WITH SAME HASH CODE

A - ACTIVITY BIT. 0 IF ACTIVE, 1 IF INACTIVE ENTRY

C - CALLABILITY BIT SET IF ENTRY POINT IS UNCALLABLE

H - HIDDEN ENTRY POINT. SET IF ENTRY POINT WILL NOT BE IN LIBRARY DIRECTORY

NC - NUMBER OF CHARACTERS IN NAME. MAX IS 16





Entry Type 8 (Cont.)

CHAR 1 - FIRST CHARACTER IN VARIABLE LIST

CHAR NC - LAST CHARACTER IN VARIABLE LIST

L - LAST ENTRY IN LIST
0 IF NOT LAST
1 IF LAST

SECL - SECONDARY ENTRY POINT LIST LINK

SSA - UNIT STARTING PB' ADDRESS

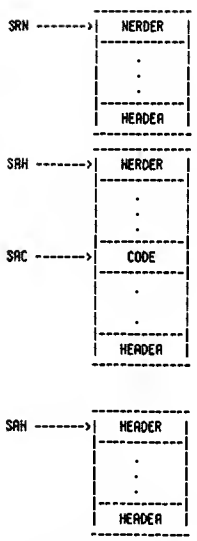
P - PARM CHECKER
00 NO CHECKING (IMPLIES NP UNDEFINED, TH AND PARMS ABSENT)
01 CHECK PROCEDURE TYPE (IMPLIES NP IS UNDEFINED AND PARMS ABSENT)
10 CHECK PROCEDURE TYPE AND NUMBER OF PARMS. (IMPLIES PARMS ABSENT)
11 CHECK PROCEDURE TYPE, NUMBER OF PARMS AND TYPE OF PARM.

HP - NUMBER OF PARMS

CM - CHARACTER COUNT OF PARMS

TH - PROCEDURE TYPE

Entry Header Format




ERCH ENTRY (EXCEPT SECONDRRY EHTRY POINT EHTRIES) MRY DESCRIBE H> 0 SETS OF HEADERS. THE HEADERS IH EACH SET MUST BE CONTINUOUS AND IN THE SAME ORDER AS THE HOW LIST DESCRIBING THE SET.

THE CODE MODULE MAY BE PLACED IH ANY POSITION IH R HEADER SET. HOTE THAT IF THE CODE MODULE IS AT THE BEGIHHING OF R SET, SAC = SAH.

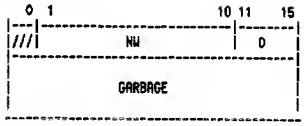
IF THE EHTRY HRS NO HERDER SET, THEH NH, SAH SEQUENCE IS ABSENT.





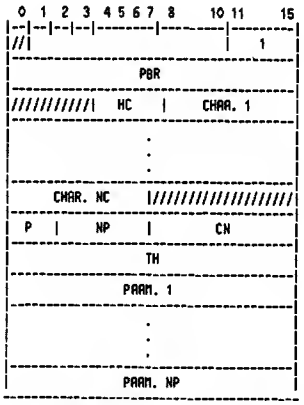
Header Type 0

GARBAGE




Header Type 1

PCALs



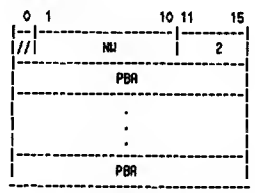

PBR - PB' ADDRESS OF LINKED LIST OF PCAL INSTRUCTIONS TO BE REPAIRED- LOWER 14 BITS USED RS HEGATIVE DISP. - BIT 0 SET MERHS THAT THE WORD IS NOT R PCAL IHSTRUCTION, BUT A POIHTER TO A SST LABEL OF ''EXTERNAL'' FORMAT - A LINK OF 0 TERMINATES THE LIST - BIT 1 SET MEANS THRT THE WORD IS TO BE INITIRLIZED WITH THE PB ADDRESS OF THE PROCEDURE.





Header Type 2

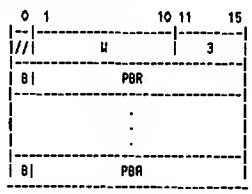
PB ADDRESSES




PBA - PB' ADDRESS OF PB ADDRESS TO BE CORRECTED

Header Type 3

OWH/ORTR VARIABLES



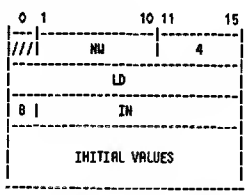

PBA - PB' ADDRESS OF OWH VRRIRBLE POIHTER TO BE CORRECTED





Header Type 4

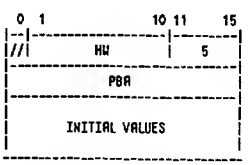
OSDB/OWH/DRTR/VRLUES




LD - LOGICAL WORD OISPLACEMENT IH OWH RRRRY FOR INITIRL VALUES
B - BYTE BIT-SET IMPLIES THAT LD IS TYPE BYTE AHD THAT THE FIRST WORD OF THE IHITIRL VRLUE BLOCK IS R COUNT OF THE HUMBER OF BYTES IH THE IHITIAL VRLUE BLOCK
IH - IHTEGRATION HUMBER - HUMBER OF TIMES THE BLOCK OF IHITIAL VRLUE IS TO RPPEAR IH THE SECONDHRY BO - 1->HO DUPLICRTION, 2->DUPLICRTION, ETC

Header Type 5

PUST

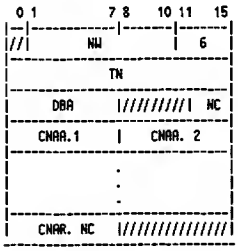



PBA - PB' ADDRESS OF LINKED LIST OF POINTERS TO BE INITIALIZED WITH OB ROORESS OF PUST (SAME LIST FORMAT AS FOR FORMAT STRINGS) A PBA of -1 INDICRTES HO FIX-UPS.

NOTE: ALL REFERENCES TO THE PUST INCLUDE THE FOUR-WORD HEADER THAT IS APPENDED BY THE SEGMENTER. THESE WORDS ARE NOT PRESENT IN THE HEADER; THEY ARE AUTOMATICALLY ALLOCATED AND INITIALIZED BY THE SEGMENTER.

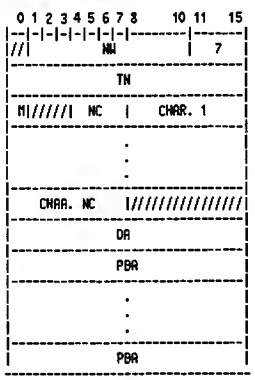
Header Type 6

GLOBAL VARIABLES




Header Type 7

EXTERNAL VARIABLES




PBA-PB' address of linked lists of instructions to be repaired; lower 8 bits of inst. used as neg. displacement to next instruction; a link of 0 terminates the list.

M -Monitored variable bit; set if variable is being monitored by debug.

OA -Logical word disp. in PUST; lower 8 bits of word will be init. with prim.DB address of variable; DA is present if M=1.

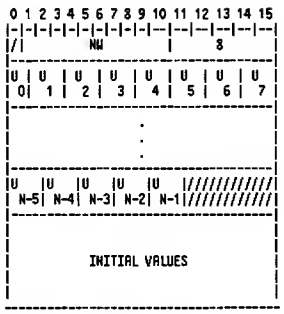
NOTE:PBA of -1 implies null list





Header Type 8

PRIMARY DB




U - ADDRESS BITS
00 IF NO ADDRESS
01 IF NO ADDRESS
10 IF WORD ADDRESS IN SECONDARY DB
11 IF BYTE ADDRESS IN SECONDARY DB

N - NWPDB

NOTE: INITIAL ADDRESSES THAT ARE SECONDARY DB ADDRESSES ARE 0

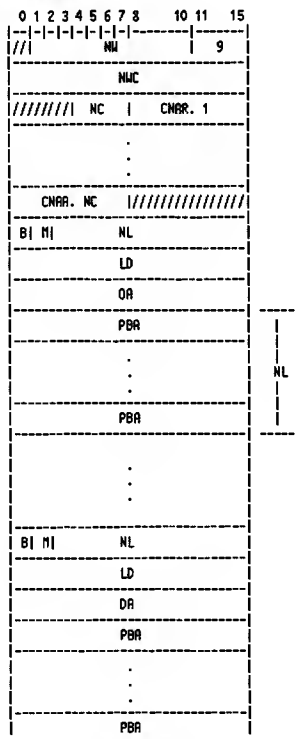
RELATIVE (I.E., THEY ARE LOGICAL DISPLACEMENTS IN SECONDARY DB).





Header Type 9

COMMON VARIABLES








Header Type 9 (Cont.)

NWC - NUMBER OF WORDS IN COMMON ARRAY

NC - NUMBER OF CHARACTERS IN COMMON NAME- IF BLANK COMMON 4 COM'

DA - LOGICAL WORD DISP. IN PUST - LOWER 8 BITS OF WORD WILL BE INIT. WITH PRIM. DB ADDRESS OF VARIABLE - NOTE DA IS PRESENT IF M = 1

B - BYTE BIT
0 IF THE PRIMARY DB POINTER TO BE ALLOCATED AND INITIALIZED AND LD ARE OF TYPE WORD
1 IF TYPE BYTE

M - MONITORED VARIABLE BIT - SET IF VARIABLE IS BEING MONITORED BY DEBUG

NL - NUMBER OF ADDRESS LISTS FOR VARIABLE

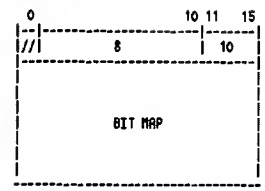
LD - LOGICAL DISPLACEMENT OF VARIABLE IN COMMON ARRAY

PBA - PB' ADDRESS OF LINKED LISTS OF INSTRUCTIONS TO BE REPAIRED LOWER 8 BITS USED AS NEGATIVE DISPLACEMENT TO NEXT INSTRUCTION A LINK OF 0 TERMINATES THE LIST

PBA = -1 INDICATES NO FIX-UPS

Header Type 10

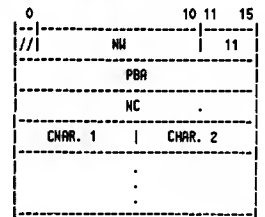
LOGICAL UNITS




BIT MAP - BIT MAP OF LOGICAL UNITS
REFERENCED; BIT 0
CORRESPONDS TO LU 0, ETC.
(1 LESS THAN OR EQUAL TO LU
LESS THAN OR EQUAL TO 99)

Header Type 11

FORMAT STRING

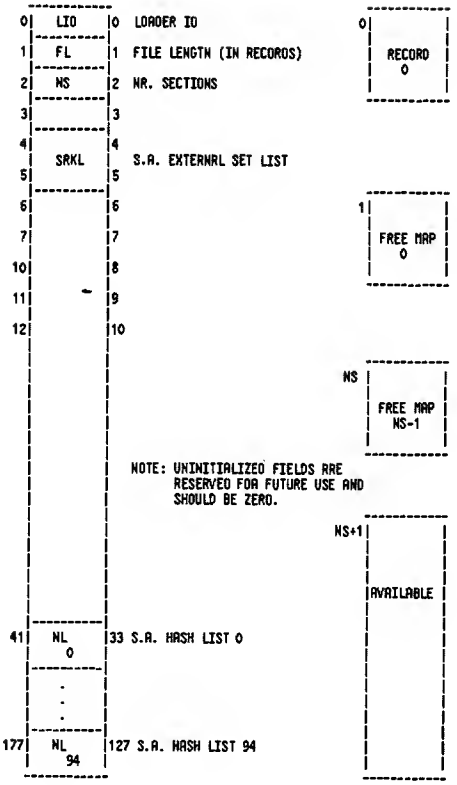



PBA - PB' ADDRESS OF LINKED LIST OF
POINTERS TO BE INITIALIZED
LOWER 14 BITS OF WORD USED
AS NEGATIVE DISPLACEMENT TO
NEXT POINTER - BIT 0 SET
MEANS THAT THE POINTER IS TO
BE TYPE BYTE - A LINK OF 0
TERMINATES THE LIST.





RL File Format







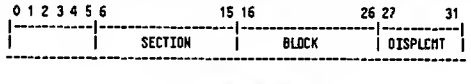

Storage Management

FILE SPACE IS MANAGED IN TERMS OF 32 WORDS BLOCKS (4 BLOCKS PER 128 WORD RECORD).

FREE SPACE (BLOCKS) IS ACCOUNTED FOR IN A BIT MAP, WHICH IS PARTITIONED INTO RECORDS (2K BLOCKS PER SECTION). A 0 INDICATES THAT A BLOCK IS USED, A 1 INDICATES THAT IT IS FREE.

FILE SPACE IS ALSO PARTITIONED INTO 512 RECORD SECTIONS (64 MAX. SECTIONS, 2K BLOCKS PER SECTION, 1 MAP PER SECTION). THE NUMBER OF SECTIONS IN A FILE IS NS=(FL+511) & LSA(9). THE FIRST NS RECORDS FOLLOWING RECORD 0 (RECORDS 1 TO NS) ARE RESERVED FOR THE SECTION MAPS.

A COMPLETE FILE ADDRESS WOULD HAVE THE FOLLOWING CONFIGURATION:

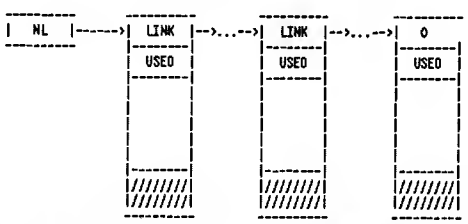



FILE (WORD) ADDRESS
DOUBLE WORD





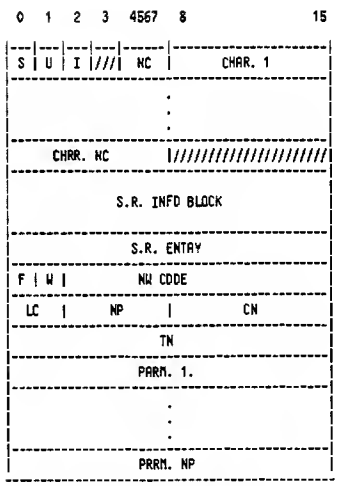
Entry Point Directory




THE DIRECTORY IS PARTITIONED INTO 95 HASH LISTS (SAME HASH FUNCTION AS USL); EACH HASH LIST IS A LINKED LIST OF RECORDS.

EACH RECORD CONTAINS A SUCCESSOR LINK (RECORD N) AND A USED SPACE COUNT. A LINK OF 0 TERMINATES A LIST. WHEN A RECORD IS VOID OF ENTRIES (USED=2), ITS SPACE IS RETURNED TO THE FREE STORAGE AREA.

Typical Directory Entry




S - SECONDARY ENTRY POINT BIT - SET IF THE ENTRY POINT WAS ORIGINALLY A SECONDRAY ENTRY POINT.

U - UNCALLABLE BIT - SET IF ENTRY POINT IS UNCALLABLE.

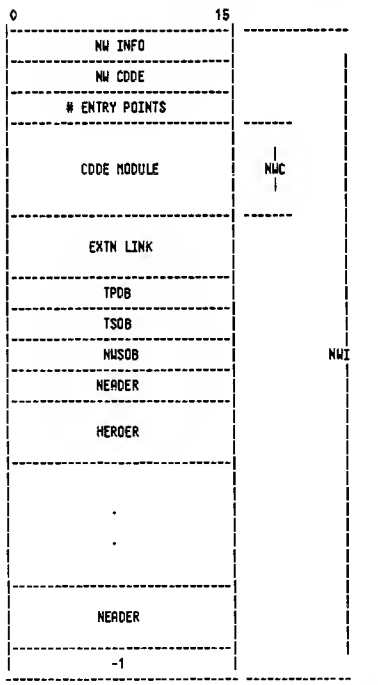
I - PRIVILEGED MODE BIT - SET IF CODE MODULE IS TO BE RUN IN PRIVILEGE MODE.

LC is (0:2)...Level of Checking
0 = No checking
1 >= Check for procedure type
2 >= Check for # parameters
3 >= Check for parameter type
NP is (2:6) is # parameters





Procedure Information Block

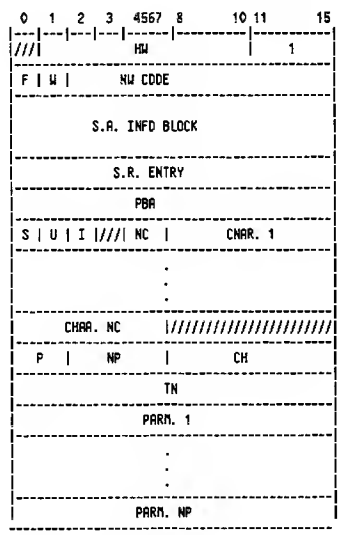



ALL HEADERS FOR THE PROCEDURE ARE APPENDED TO THE INFO BLOCK. THE HEADER SETS (EXTERNAL LISTS) ARE LINKED BY INCREASING FILE ADDRESS; A LINK OF X17777777777D TERMINATES THE LIST.





Headers




F - SET IF FATAL ERROR
W - SET IF NON-FATAL ERROR
S - SATISFIED BIT - SET IF EXTERNAL IS SATISFIED WITHIN RL.
U - UNCALLABLE BIT
I - PRIVILEGED BIT

ALL HEADERS ARE THE SAME AS IN A USL EXCEPT FOR THE PCAL HEADER.

# CHAPTER 10 PREPARED OBJECT CODE

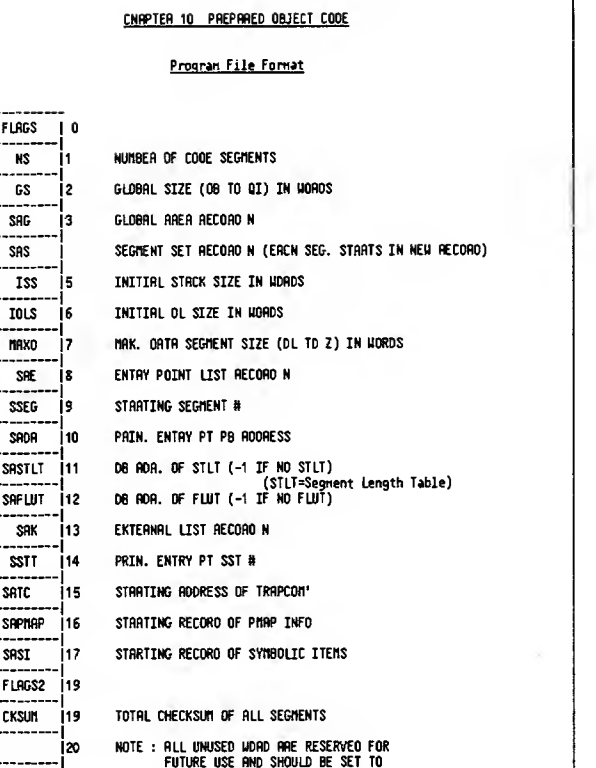
## Program File Format

| | | | |
|---|---|---|---|
| 0 | FLAGS | 0 | |
| 1 | NS | 1 | NUMBER OF CODE SEGMENTS |
| 2 | GS | 2 | GLOBAL SIZE (DB TO QI) IN WORDS |
| 3 | SAG | 3 | GLOBAL AREA RECORD N |
| 4 | SAS | | SEGMENT SET RECORD N (EACH SEG. STARTS IN NEW RECORD) |
| 5 | ISS | 5 | INITIAL STACK SIZE IN WORDS |
| 6 | IOLS | 6 | INITIAL OL SIZE IN WORDS |
| 7 | MAXD | 7 | MAX. DATA SEGMENT SIZE (DL TO Z) IN WORDS |
| 10 | SAE | 8 | ENTRY POINT LIST RECORD N |
| 11 | SSEG | 9 | STARTING SEGMENT # |
| 12 | SADA | 10 | PRIN. ENTRY PT PB ADDRESS |
| 13 | SASTLT | 11 | DB ADR. OF STLT (-1 IF NO STLT) (STLT=Segment Length Table) |
| 14 | SAFLWT | 12 | DB ADR. OF FLWT (-1 IF NO FLWT) |
| 15 | SAK | 13 | EXTERNAL LIST RECORD N |
| 16 | SSTT | 14 | PRIN. ENTRY PT SST # |
| 17 | SATC | 15 | STARTING ADDRESS OF TRAPCOM' |
| 20 | SAPMAP | 16 | STARTING RECORD OF PMAP INFO |
| 21 | SASI | 17 | STARTING RECORD OF SYMBOLIC ITEMS |
| 22 | FLAGS2 | 19 | |
| 23 | CKSUM | 19 | TOTAL CHECKSUM OF ALL SEGMENTS |
| 24 | | 20 | NOTE : ALL UNUSED WORD ARE RESERVED FOR FUTURE USE AND SHOULD BE SET TO ZERO. |
| 25 | | 21 | |
| 26 | | 22 | |





## Program File Format (Cont.)




P-PRIVILEGED MODE
S-Segment STT format: 0=> old format, 1=> new (extended) format
N=NS -1
K=28 + (NS +1) & LSA (1)
L=((28 + NS + (NS + 1)&LSA(1) + 127)/128)128 - 1





## Flags

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | W | Z | P | /// | /// | / | | BA | IA | PM | | | MA | /// | / | DS | PN |

F - FATAL ERROR IN PROGRAM
W - NON-FATAL ERROR IN PROGRAM
Z - ZERO UNIT OL AREA
P - SET IF ANY SEG IS PRIVILEGED MODE (IF NOT SET NORMAL= NONPRIV MODE)

CAPABILITIES

- BATCH ACCESS (9) [BA]
- INTERACTIVE ACCESS (8) [IA]
- PRIVILEGED MODE (7) [PM]

ACCESS TO GENERAL RESOURCES <

- MULTIPLE AINS (4) [MA]
- EXTRA DATA SEGMENT (2) [DS]
- PROCESS HANDLING (1) [PH]





## Flags2

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T | K | RESERVED | | | | | | | | | | | | | |

T - PATCH AREA EXISTED IN ALL CODE SEGMENTS
K - CHECKSUM VALID

### CST Remapping Array

CONTAINS THE LAST CST NUMBERS ASSIGNED TO THE SEGMENTS; INDEXED BY SEGMENT NUMBER. WHEN A PROGRAM FILE IS PREPARED, THE AAAAY IS INITIALIZED TO 0, 1...,N. THIS AAAAY IS USED TO RE-ESTABLISH INTRA-PROGRAM LINKAGE WHEN THE PROGRAM IS LOADED.

### Segment Descriptor Array

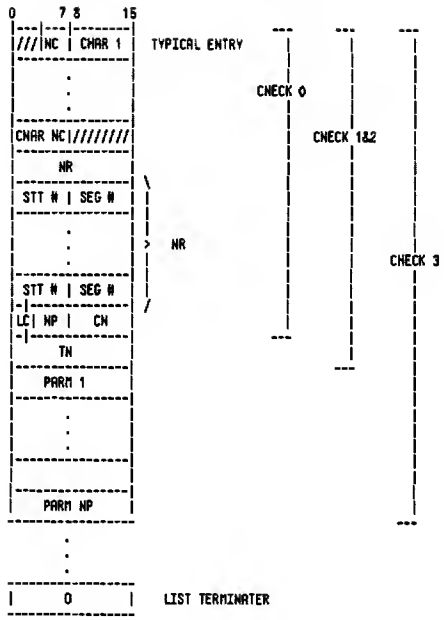
CONTAINS THE SEGMENT LENGTH AND A FLAG INDICATING IF THE SEGMENT IS TO BE LOADED IN PRIV. MODE. INDEXED BY SEGMENT NUMBER. ALL SEGMENTS BEGIN ON A RECORD BOUNDARY. THE NUMBER OF RECORDS FOR A GIVEN SEGMENT IS (SL + 127) & LSR(7). THE RECORD NUMBER, SAS, OF SEGMENT N IS

```
SAS:=0
FOR I=0 TO N-1
 BEGIN
 SAS:=SAS + (SL(I) + 127)&LSA(7)
 END
```

### Global Area Format

A SET OF RECORDS CONTAINING THE INITIAL VALUES FOR THE GLOBAL AREA OF THE DATA SEGMENT. THIS SET BEGINS AT RECORD SAG (WORD 3) AND CONSISTS OF (GS + 127) & LSR(7) RECORDS.

External List




LC (0:2) = LEVEL OF CHECKING
0 = NO CHECKING
1 >= CHECK FOR PROCEDURE TYPE
2 >= CHECK FOR # PARAMETERS
3 >= CHECK FOR PARAMETER TYPE

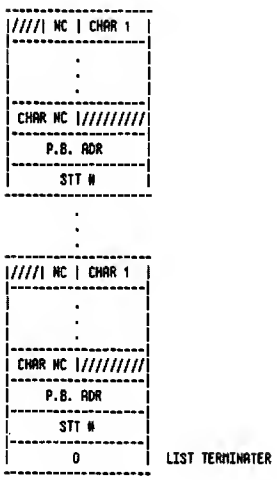
NR = NUMBER OF REFERENCES

NP (2:6) = NUMBER OF PARAMETERS





Entry Point List



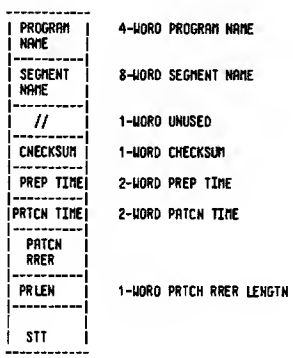

NOTE THAT THE ENTRY POINT LIST MUST IMMEDIATELY FOLLOW THE EXTERNAL LIST.





Code Segment With Patch Area

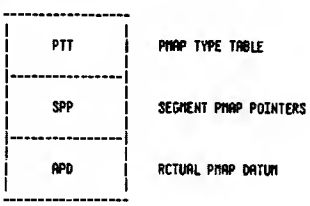

Patch Area



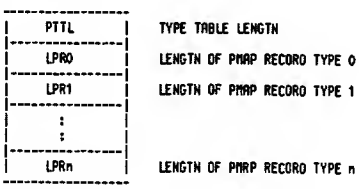





PMAP Information



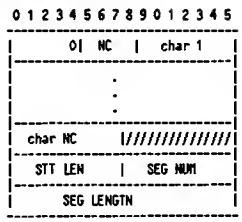

PMAP Type Table



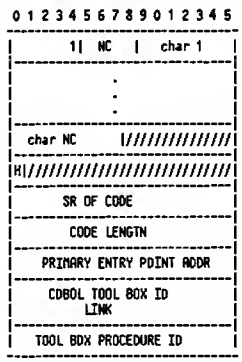

NOTE : n = PTTL - 2

PMRP Records

Type 0 Segment PMAP Record



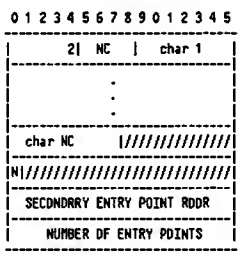

Type 1 Procedure PMRP Record








Type 2 Secondary Entry PMRP Record

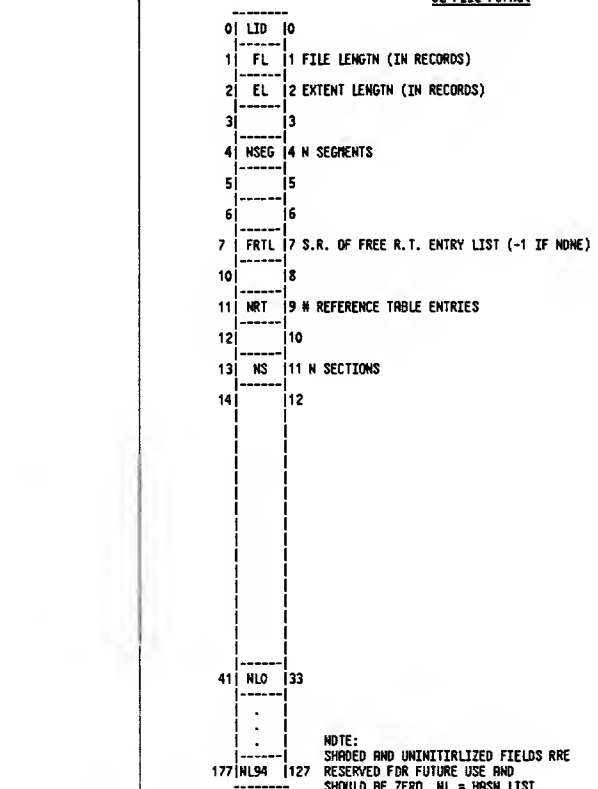



N : HIDDEN ENTRY FLAG





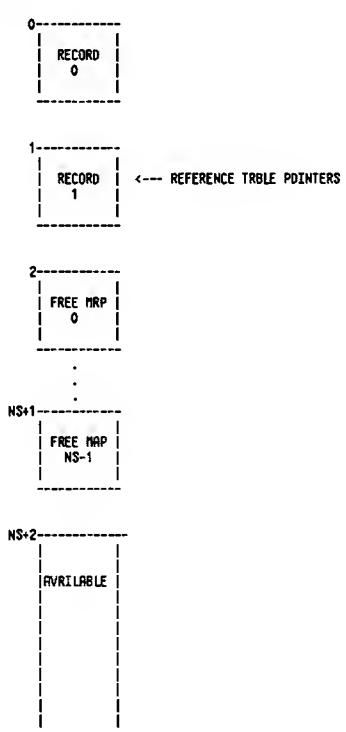
SL File Format








SL File Format (Cont.)



## Storage Management

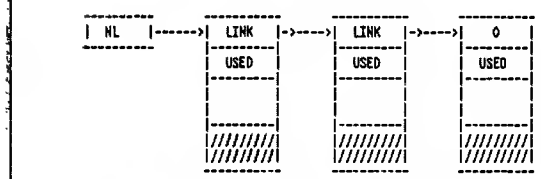
FILE SPACE IS MANAGED IN TERMS OF 128 WORD BLOCKS (1 BLOCK PER 128 WORD RECORD).

FREE SPACE (BLOCKS) IS ACCOUNTED FOR IN A BIT MAP, WHICH IS PARTITIONED INTO RECORDS (2K BLOCKS PER SECTION). A 0 INDICATES THAT A BLOCK IS USED; A 1 INDICATES THAT IT IS FREE.

FILE SPACE IS ALSO PARTITIONED INTO 2048 RECORD SECTIONS (16 MAX. SECTIONS, 2K BLOCKS PER SECTION 1 MAP PER SECTION). THE NUMBER OF SECTIONS IN A FILE IS NS=(FL + 2047) & LSR(7). THE FIRST NS RECORDS FOLLOWING RECORDS 0, 1 (RECORDS 2 TO NS+1) ARE RESERVED FOR THE SECTION MAPS.

IF THE SECTION MAPS SPECIFY MORE SPACE THAN IS POTENTIALLY AVAILABLE, THOSE RECORDS BEYOND FLIMIT ARE MARKED AS "USED".

## Entry Point Directory




THE DIRECTORY IS PARTITIONED INTO 95 HASH LISTS (SEE HASH FUNCTION AS USL); EACH HASH LIST IS A LINKED LIST OF RECORDS.

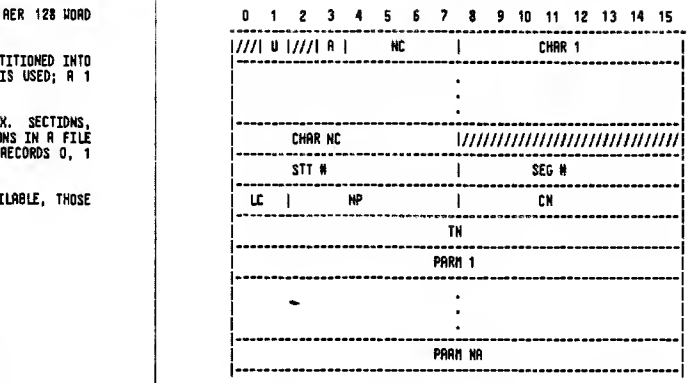
EACH RECORD CONTAINS A SUCCESSOR LINK (RECORD #) AND A USED SPACE COUNT. A LINK OF 0 TERMINATES A LIST. WHEN A RECORD IS VOID OF ENTRIES (USED=2), ITS SPACE IS RETURNED TO THE FREE STORAGE AREA.

THE HASH LIST HEAD POINTERS (HL IN THE DIAGRAM ABOVE) ARE IN RECORD 0 WORDS X41 TO X177.





## Typical Directory Entry




LC is (0:2)...Level of Checking
0 = No checking
1 >= Check for procedure type
2 >= Check for # parameters
3 >= Check for parameter type
NA is (2:6) is # parameters

A - 0= Not permanently allocated
1= Permanently allocated

U - Uncallable bit - set if entry point is uncallable.





## Code Segment Linkage Structure


EACH CODE SEGMENT OCCUPIES AN INTEGRAL NUMBER OF RECORDS. THIS BLOCK OF INFORMATION CAN BE SUBDIVIDED INTO THREE TABLES: THE CODE SEGMENT PROPER, AN STT SEGMENT MAP ARRAY, AND AN EXTERNAL LIST.

STT MAP ARRAY

A 1 BYTE X 256 BYTE ARRAY. IT IS INDEXED BY STT NUMBER AND RETURNS (IF THE STT CORRESPONDS TO AN EXTERNAL OF THE SEGMENT) THE SEGMENT NUMBER OF THE EXTERNAL AND 255 OTHERWISE. THIS ARRAY IS USED WHENEVER THE SEGMENT IS LOADED AND IS UPDATED WHENEVER THE SL IS BOUND BY THE SEGMENTER.

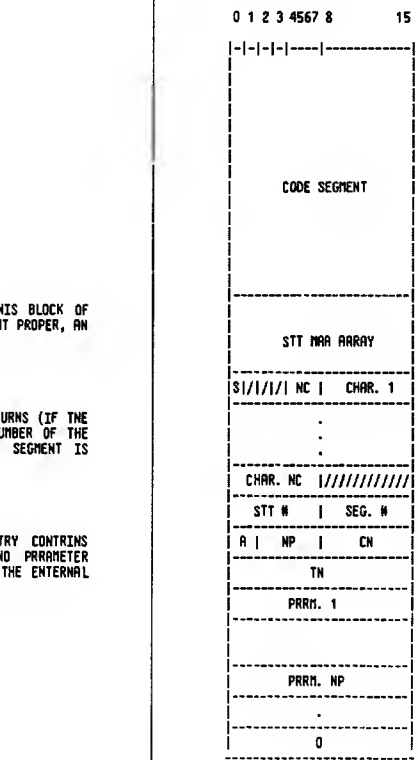
EXTERNAL LIST

A SYMBOLIC LIST OF THE EXTERNALS OF THE SEGMENT. EACH ENTRY CONTAINS INFORMATION ABOUT THE EXTERNAL: PARAMETER CHECKING LEVEL AND PARAMETER MATCHING INFORMATION, AND THE SEGMENT NUMBER AND STT NUMBER IF THE EXTERNAL IS SATISFIED WITHIN THE SL.





## Code Segment Structure (Cont.)




S - SATISFIED BIT - SET IF EXTERNAL IS SATISFIED WITHIN SL

EXTERNAL LIST TERMINATOR

## Reference Table Structure

FOR EACH SEGMENT THERE IS A REFERENCE TABLE ENTRY OF 32 WORDS. THE REFERENCE TABLE ENTRIES ARE PACKED FOUR TO A RECORD. THE RECORDS CONTAINING THE REFERENCE TABLE ENTRIES ARE LISTED IN RECORD 1. THE RECORD CONTAINING REFERENCE TABLE ENTRY N IS REC 1 (N.(0 : 14)); THE FIRST WORD OF THE ENTRY IS REFTAB (N.(14 : 2) & LSL (5)).

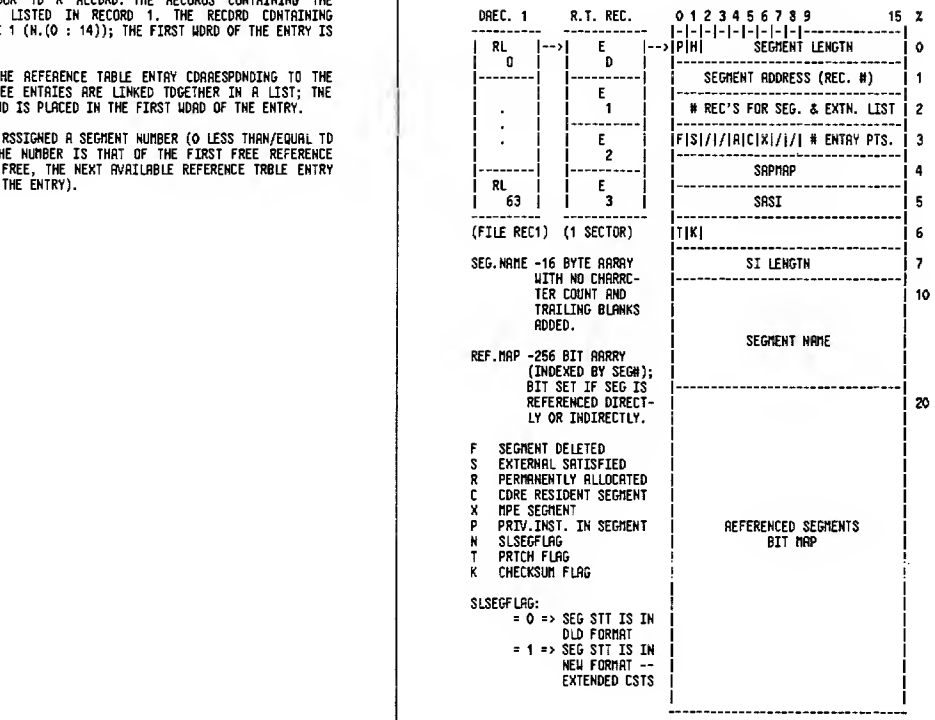
WHEN A SEGMENT IS DELETED, THE REFERENCE TABLE ENTRY CORRESPONDING TO THE SEGMENT IS RELEASED. THESE FREE ENTRIES ARE LINKED TOGETHER IN A LIST; THE SEGMENT # IS USED AS A LINK AND IS PLACED IN THE FIRST WORD OF THE ENTRY.

WHEN A SEGMENT IS ADDED IT IS ASSIGNED A SEGMENT NUMBER (0 LESS THAN/EQUAL TO N LESS THAN/EQUAL TO 254); THE NUMBER IS THAT OF THE FIRST FREE REFERENCE TABLE ENTRY, OR, IF NONE ARE FREE, THE NEXT AVAILABLE REFERENCE TABLE ENTRY (CAUSING SPACE ALLOCATION FOR THE ENTRY).





## Reference Table (256 Maximum Entries)

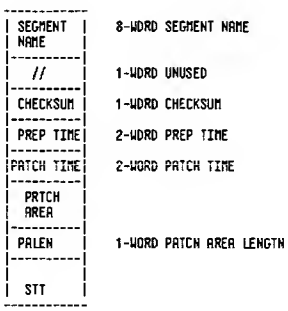







## Code Segment With Patch Area


### Patch Area



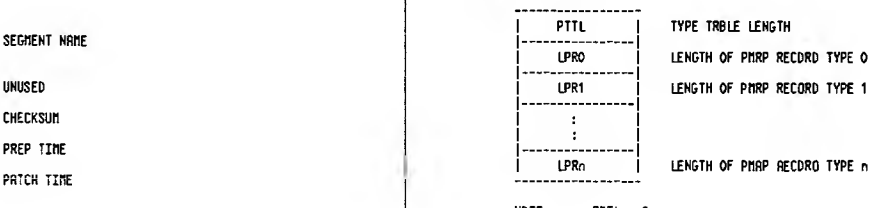





## PMAP Information



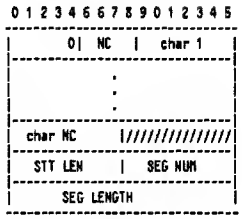

### PMAP Type Table



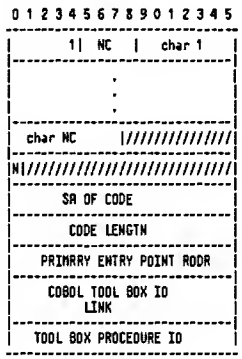

NOTE : n = PTTL - 2

PMAP Records

Type 0 Segment PMAP Record



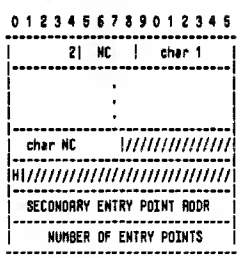

Type 1 Procedure PMAP Record








Type 2 Secondary Entry PMAP Record




N : HIDDEN ENTRY FLAG

## CHAPTER 11 LOADER

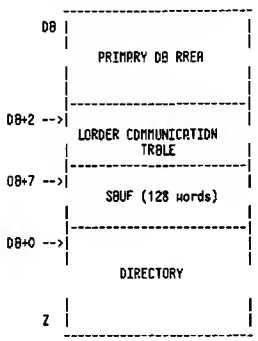
### MPE Loader

The loader is a system process which will do loads sequentially. If a process needs code to be loaded, it will get the load process' SIR, fill loader communication table, and then awake the loader. Upon completion, the loader will return its status through the loader communication table, and then activate the waiting process.

### Loader Segment Table Overview

Loader Segment Table consists of two DST's. The main one is DST %22 (LST). The other DST (XLST) has its DST number stored in SYSGLOB %226.

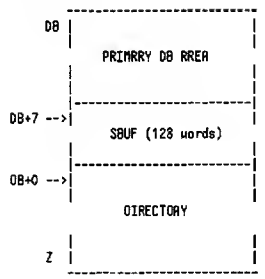
LST Overview








XLST Overview

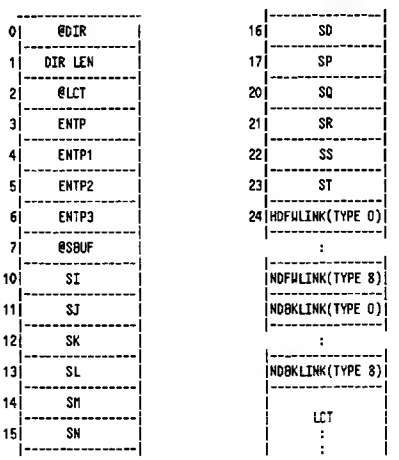



The above DST's has exactly the same primary DB area so that directory entry handling procedures can be used on both DST'S. NLST is the LST extension and is used to store the extension entry only. When an extension entry is needed, it is copied into the LST to eliminate frequent EXCHANGEDB. Note that XLST is capable for any types of entries. It is used for extension entry only for now. Also, some of the primary DB's in the XLST are not used. They are there just for the consistency.





### Loader Segment Table Primary DB

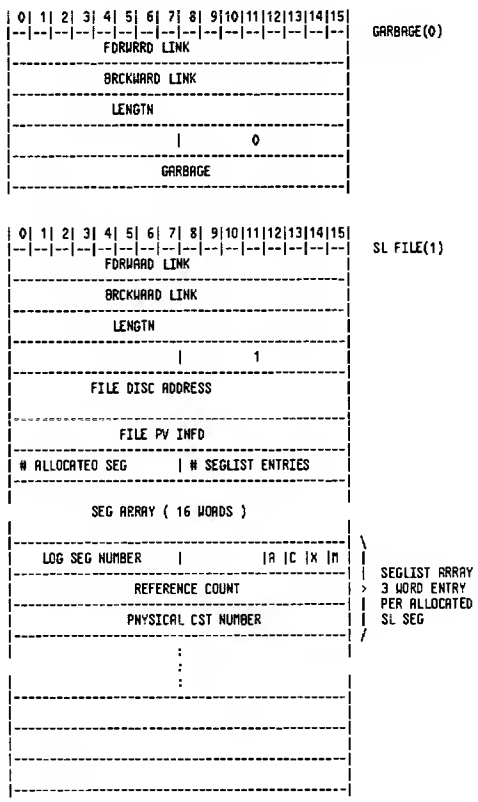



ENTPn : POINTERS POINT TO THE CURRENT ACCESSED ENTRY.
SBUF : UTILITY BUFFER. USUALLY CONTAINS PROGRAM FILE RECORD 0 INFORMATION.
SI ST : UTILITY DB RELATIVE VARIABLES.
NDFWLINKs : HEAD OF FORWARD LINK FOR EACH TYPE.
NDBKLINKs : HEAD OF BACKWARD LINK FOR EACH TYPE.

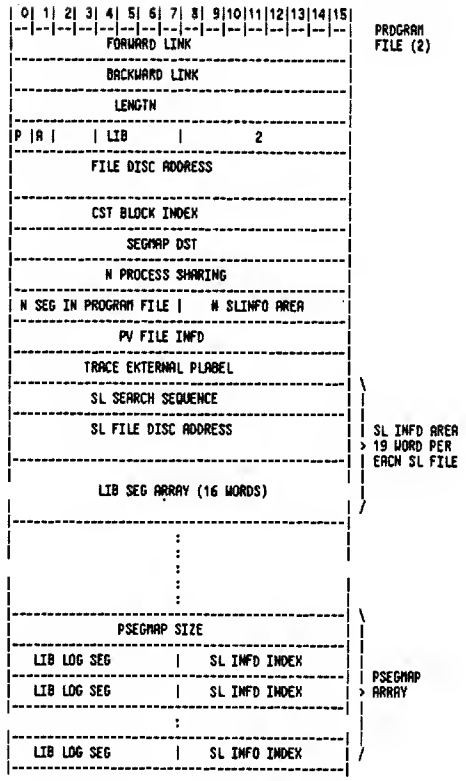




### Directory Entries



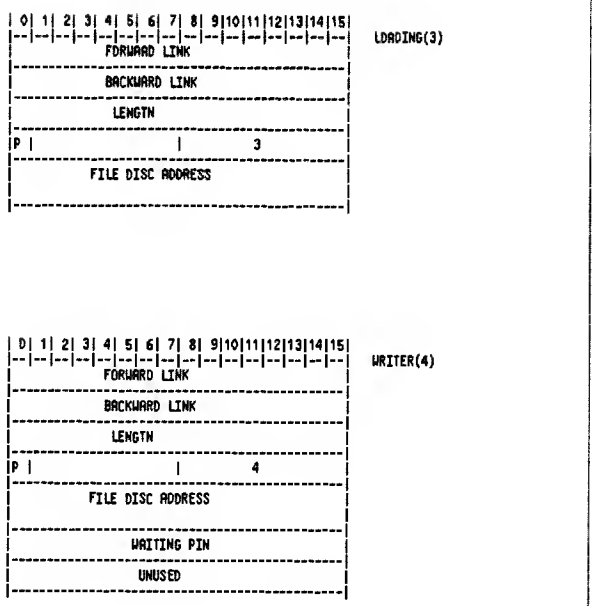
## Directory Entries (Cont.)







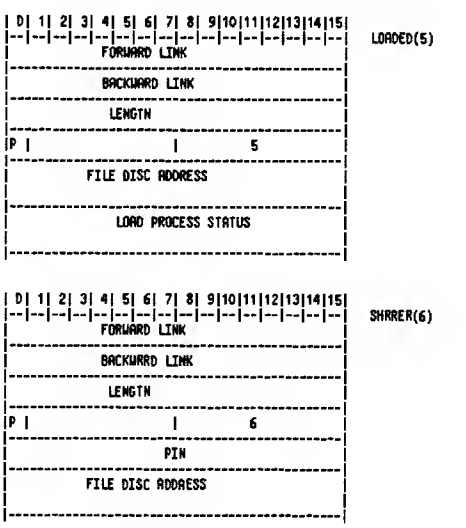

## Directory Entries (Cont.)







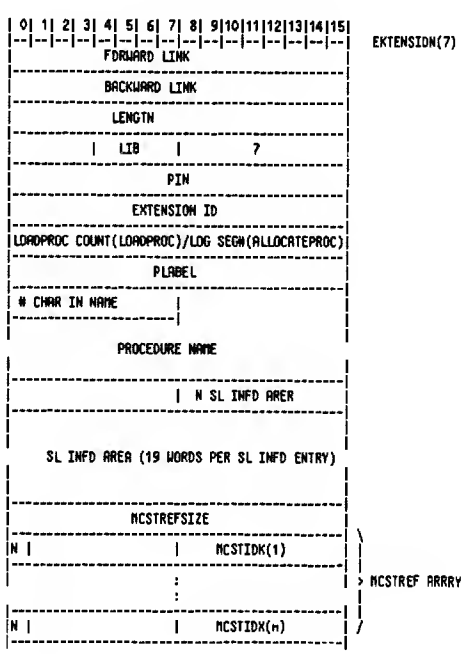

## Directory Entries (Cont.)



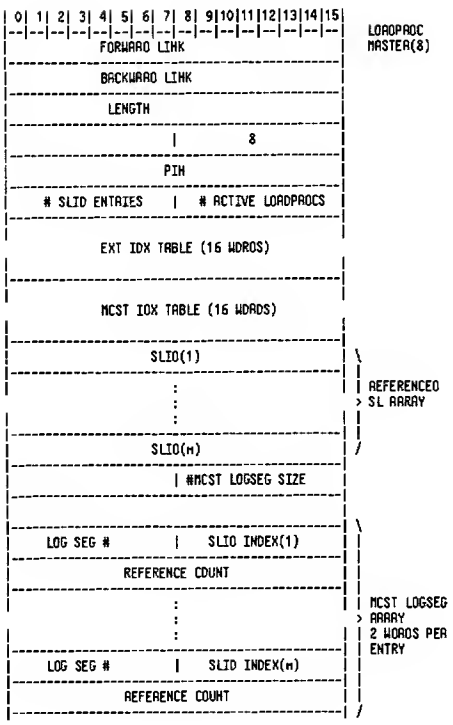





## Directory Entries (Cont.)



## Directory Entries (Cont.)



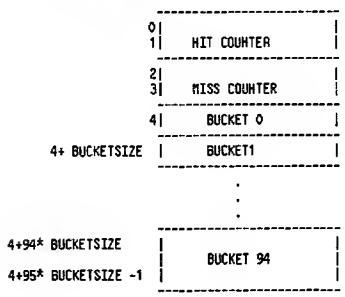




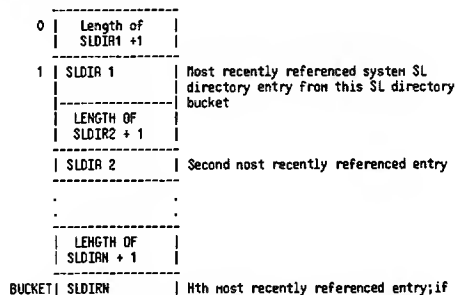

## Loader Cache

SYGLOB extension area + X72 contains OST number of cache
BUCKETSIZE = X52

Cache Data Segment Format




Bucket Format



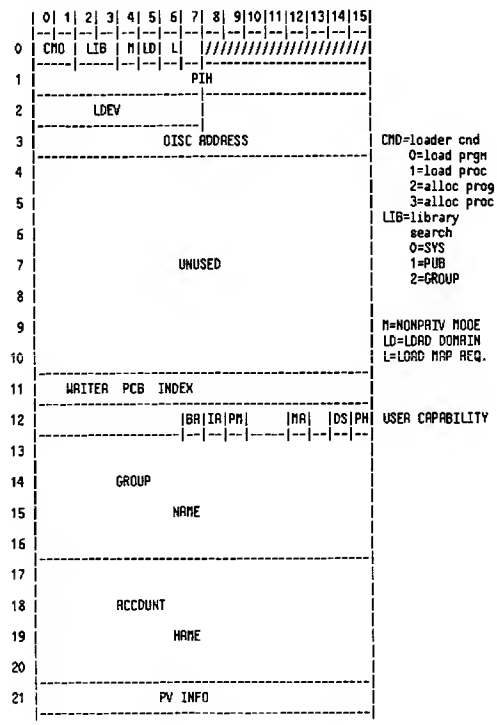

All bucket words are initialized to BUCKETSIZE +1, indicating no entries.





## Loader Communication Table (LCT)

Form Incoming to Loader (Load/Allocate Program)

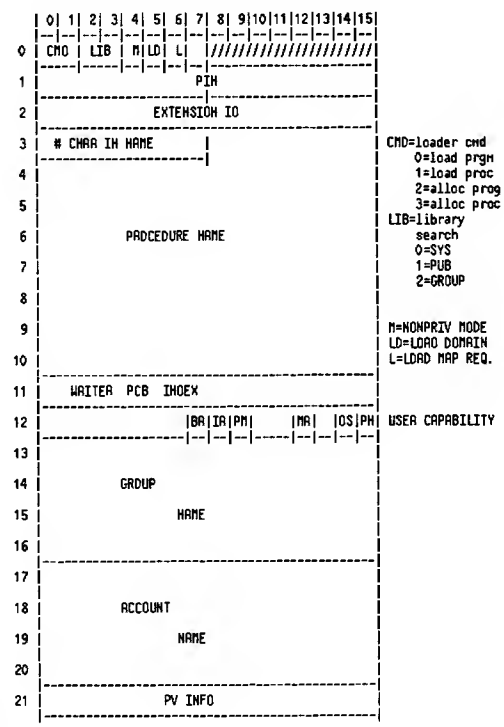






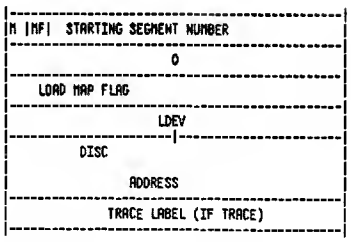

## LCT (Cont.)

Form Incoming to Loader (Load/Allocate Procedure)

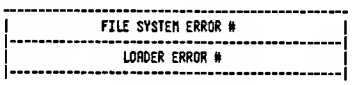


## LCT (Cont.)

Form Returned (No Error)




Form Returned (Error Occurred)








## Logical Segment Transform Table (LSTT)

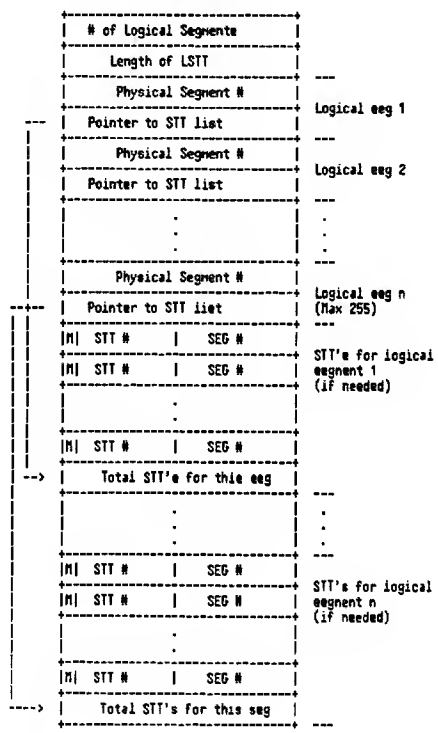
When a process references any user SL segments, these segments are assigned logical segment numbers if the new mapping ucode is running. The LSTT provides a map mapping these logical segments into their physical segment numbers and having true STT's for the mapped segments. The LSTT is created by LOADER during the load time. It occupies an OST and the OST number is stored in PCB(15). If no user SL segment is referenced, the LSTT will not be needed, hence it will not be created.

The new mapping microcode depends on the existence of the LSTT for getting the physical segment number for a mapped segment. So the LSTT has to be included in process' locality list if there is an LSTT. Dispatcher will then bring the LSTT in before the process can be run. Also the bank and address for the LSTT belonging to the current running process are stored in sysglob cells ( %221 and %222 ) during the launch time by the dispatcher. These cells are used by microcode for fast accessing the LSTT.



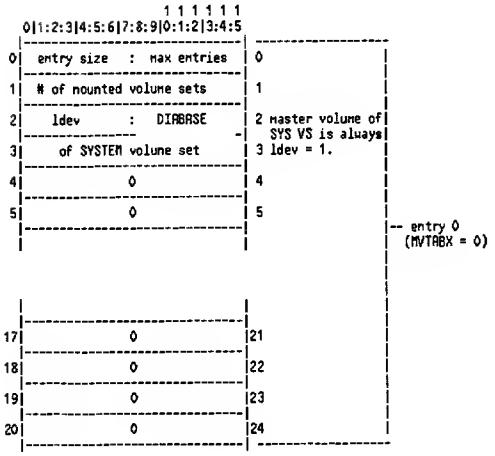


## Logical Segment Transform Table (LSTT) (Cont.)



CHAPTER 12 PRIVATE VOLUMES / SERIAL DISC

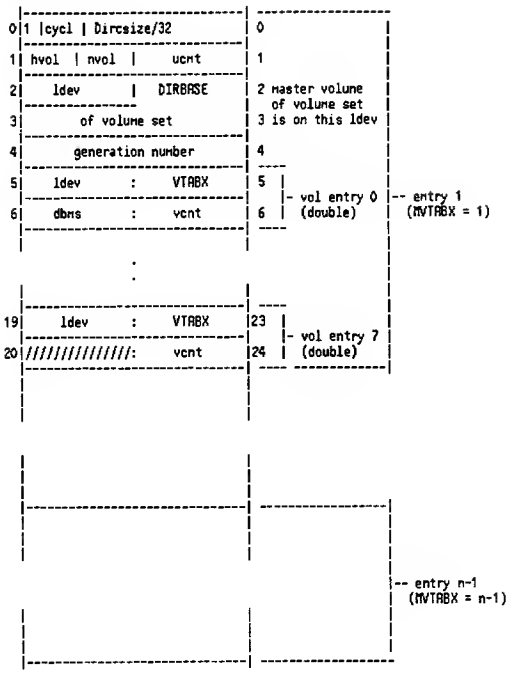
Mounted Volume Table (MVTAB)
DST =53 =%65
SIA =27 =%33







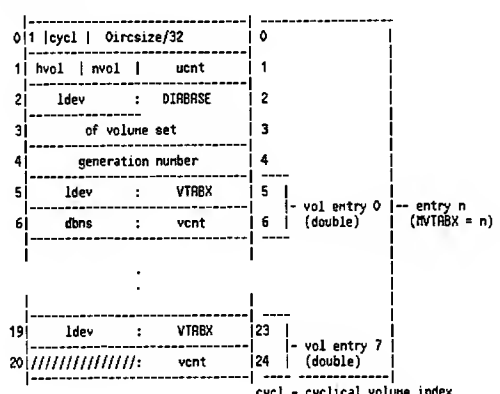

MVTAB (Cont.)








MVTAB (Cont.)




cycl - cyclical volume index (local VTABX) for disc space allocation

hvol - highest (ordinal) volume index (volume index being the volume set's local VTABX) of a mounted member of the volume set(class).

nvol - # of volumes mounted for the volume set(class).

ucnt - # of users having mounted the volume set.

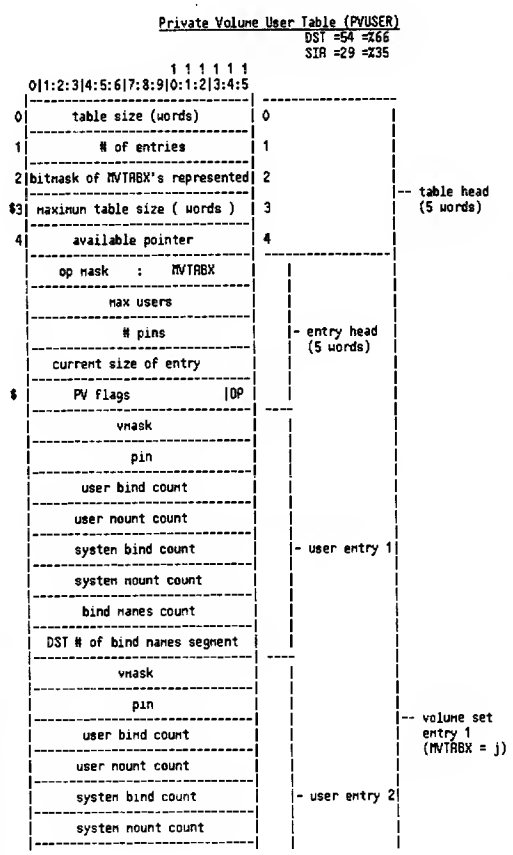
dbns - directory bit map size (sectors).

vcnt - # of users having mounted the volume.

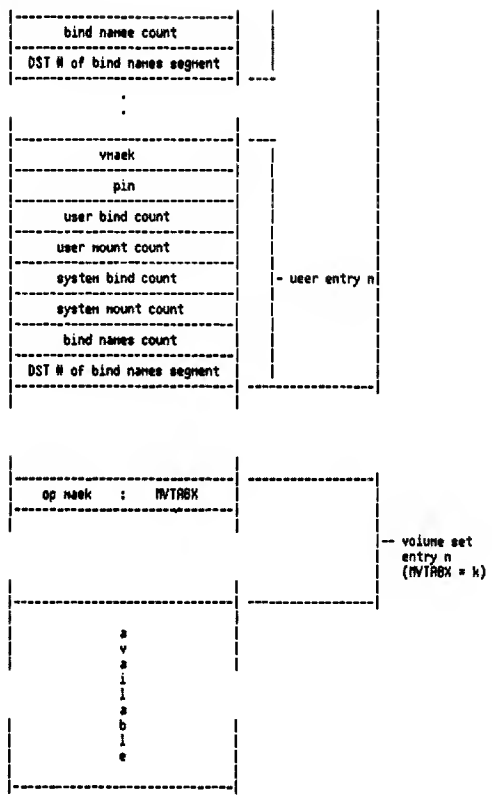




Private Volume User Table (PVUSER)
DST =54 =%66
SIA =29 =%35



PVUSER (Cont.)

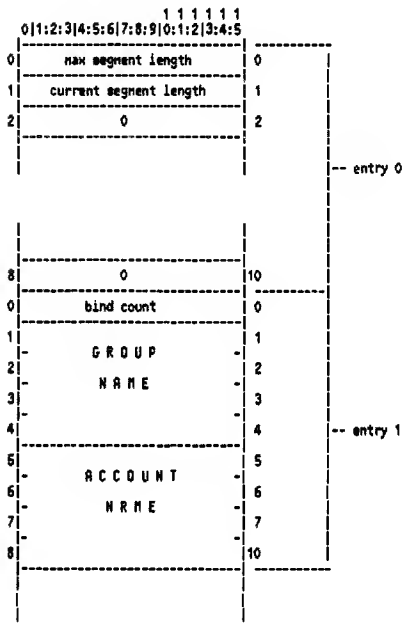







Bind Names Data Segment

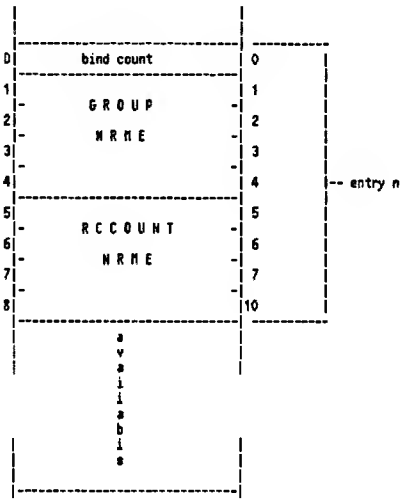
(Created and managed via PVUSER Table)








Bind Names Data Segment (Cont.)





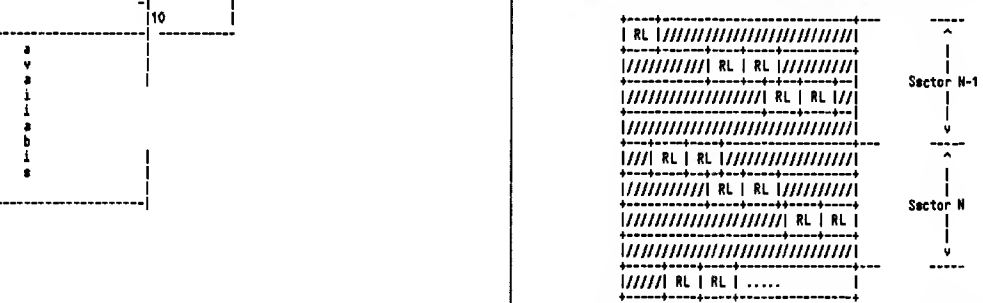



Serial Disc Tables and Data Structures

Data Record Format

The primary purpose of the Serial Disc Interface (SDISC) is to adapt the undefined length transfers characteristic of magnetic tape to the fixed-length environment of a disc or cartridge tape (CTAPE). To accomplish this, data is buffered within SDISC. The buffer is an integral number of sectors (blocks for the CTAPE) long. Files always start on a sector boundary, but data records within files may start anywhere and straddle sector boundaries. A record in the buffer is structured as follows:

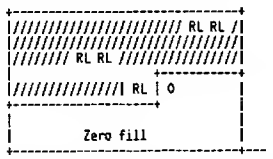

The record length is always a one-word positive byte count which includes only the data portion of the record, not the length words themselves. Records within a file might be stored on the disc as follows:




The reason for the trailing byte count is to implement an easy way to backspace records.

## End of File Format

Since files always start on a sector boundary, it follows that they also end on one. End of files consist of a 0 record length and 0-fill to the end the current sector as follows:



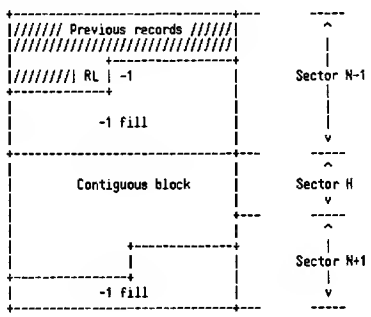

In addition, an End-of-File entry is made in the Gap Table, so that files may be skipped by scanning Gap Table entries instead of serially scanning the data area. The Gap Table is described a few pages from now.





## Contiguous Block Format

A serial disc, if it can do everything a magnetic tape can do, must also be a cold-load device. This means that machine microcode must be able to read a bootstrap channel program and the resident segments of INITIRL from the disc into memory. The microcode and channel programs cannot deal with the record length words which surround standard data records, so for them we have a structure, called a CONTIGUOUS BLOCK, which has the data without the length words. Information as to the length of each contiguous block must therefore be kept elsewhere, so there are Gap Table entries which hold the beginning and ending sector addresses of each contiguous block. This implies that each block must begin and end on a sector boundary. In this way they are similar to data files. To set contiguous blocks off from normal data, and to reach a sector boundary, a record length and fill character = %177777 is used, as follows:




## Hole Format

Holes on the serial disc have the same format as contiguous blocks (that is, they start and end on sector boundaries with -1 fill characters as required). Starting with MPE version G.00.00, holes are obsolete and SDISC will not generate them. However, code has been left in SOISC to process any holes found on serial discs written with earlier versions of SDISC. Further details may be found in the Serial Disc IMS.



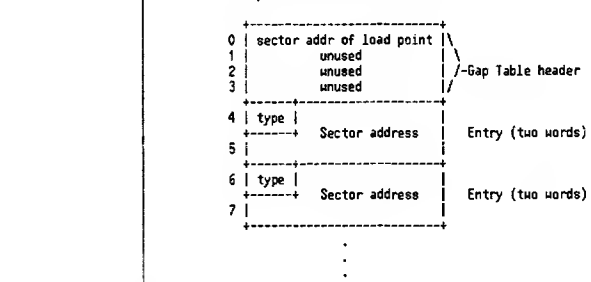


## Gap Table Format

The Gap Table is a four-word header followed by a series of two-word device address entries. A permanent copy lives on the device, starting in sector 4, while a working copy lives in main memory. The copy in memory is posted to the disc only when a backspace or rewind operation occurs after writing (in other words, when the copy in main memory has changed). The length of the Gap Table is device-dependent according to the table below:

| Device | Number of sectors (or CTAPE blocks) |
|---|---|
| HP7920 | 44 |
| HP7925 | 106 |
| HP7933/35 | 219 (250 for G.00.00 and later releases.) |
| HP7902/7895 | 26 |
| HP9110/HP9144 | 4 blocks ("S" cartridge) |
| HP9110/HP9144 | 15 blocks ("L" cartridge) |

The Gap Table looks like this:




The type field is bits 0, 1 and 2 of the first word. The eight possible types are:

0. End of File. The associated sector address contains one or more end of file fill characters (0) to fill out that sector. In the worst case (the previous record ended exactly at the end of the previous sector), the end of file sector contains all zeros.
1. End of data. The associated sector address is the last address of valid data plus 1, in other words, the next available address. In practice, such an entry is usually preceded by an end-of-file entry, since the EOD entry is written when you stop writing, and the file system will not let you backspace or rewind after writing without sending a Write End of File. An EOD entry is also written at the beginning of the Gap Table when new (unwritten) media is inserted. This prevents erroneous reading of blank media.





2. Beginning of Hole. The starting address of a "defective" area of the disc. Usually on a track boundary, but may be in mid-track if a contiguous block was being written when the "defect" was encountered. Obsolete, starting with MPE version G.00.00.
3. End of Hole. The corresponding ending address of the "defective" area. Always at a track boundary. Obsolete, starting with MPE version G.00.00.
4. Beginning of (contiguous) Block. The starting address of a contiguous block, exclusive of the -1 fill characters which may have been required to get us to a sector boundary. Unlike the End of File fill characters, there need not be any -1 characters if the previous record or contiguous block (with or without the trailing length word) ended exactly on a sector boundary.
5. End of (contiguous) Block. The address of the last sector containing contiguous block data. The sector may also contain -1 fill characters to get us to a sector boundary, but as with the beginning of block they are not required if the contiguous block ends exactly on a sector boundary.
6. End of Tape Mark. The sector address of the simulated End of Tape reflector. This type is now written only to floppy discs for use by INITIRL's serial disc interface. When read by MPE's SOISC, it will be skipped no matter what device it is found on. This ensures compatibility with older serial discs.
7. End of Gap Table. No associated sector address. If you hit this while scanning the Gap Table, you've gone too far. In practice, this type is created whenever the Gap Table is cleared, by the simple device of initializing the table to -1.

## SDISC Extra Data Segments

With insignificant exceptions, SDISC operates entirely in split-stack mode, that is, using an extra data segment for its working storage. Starting with MPE version G.00.00, there are two additional data segments used as no-wait data buffers. For the most part, our discussion here is restricted to the original data segment, now used only for variables, the Gap Table, and data buffer management.

The working storage extra data segment (XDS) is usually acquired by the external procedure ALLOCATE when the serial disc device is first assigned to a user as part of an FOPEN. The external procedure DEALLOCATE makes the XDS go away as part of its processing of the final FCLOSE against the device. The system program PVPROC may also acquire and release an XDS so that the tape label routines in LABSEG may also use SDISC for their work when DEVREC processes a device on-line interrupt. SDISC allocates the two data buffer segments as they are needed, then deallocates them as part of the Device Close processing.

In addition to the Gap Table already described, the XDS contains SDISC's global storage area, including the data buffer management areas (BUFFER'INFO), and a small buffer (called WORKTABLE). WORKTABLE holds the contents of the Serial Disc label sector when SDISC reads it in as part of its self-configuration. It also hold the Defective Tracks Table (MAC family discs) or Defective Sector Table (CS80 discs) while reassigning suspect or deleted tracks.

The three arrays in the XDS (WORKTABLE, BUFFER'INFO and GPT (Gap Table)) are all dynamically configured by SDISC as vanilla indirect arrays, such as might have been constructed by SPL. This is done by declaring the array names as pointers, then inserting appropriately computed element-0 addresses in them.

The extra data segment is organized as follows:

| | | |
|---|---|---|
| 0 | WORDSPERSECTR | These twelve words are reserved for use by ALLOCATE when the data segment is created. However, ALLOCATE only stuffs the last five of them. We fill the first seven ourselves with information we get from the label sector. |
| 1 | SECTORSPERTRK | |
| 2 | STARTADDRESS (BOT) | |
| 3 | EOTSECTR (disc address of simulated end of tape) | |
| 4 | | |
| 5 | EODSECTR (last sector of disc) | Simulates tape runoff. |
| 6 | | |
| 7 | JUSTALLOCATED | Tells us to initialize SDISC parameters to BOT if true. |
| 8 | WRITE RING | Simulation of tape write ring. |
| 9 | FATALERROR | Disables SDISC permanently when true. |





| | | |
|---|---|---|
| 10 | Volume Fatal Error | If TRUE, disables SDISC until a new volume is mounted. |
| 11 | MAX'DSEG'SIZE | Max size of our XDS, so we can check that it's big enough. |
| | SDISC global variables, including array pointers. | |
| | WORKTABLE | Length is 512 words. |
| | BUFFER'INFO | Length is calculated as MAX'NUM'BUFFERS (currently 2) * INFO'ENTRY'SIZE (currently 8). |
| | GPT | Length varies with device, and is calculated by SDISC as part of its self-configuration. |



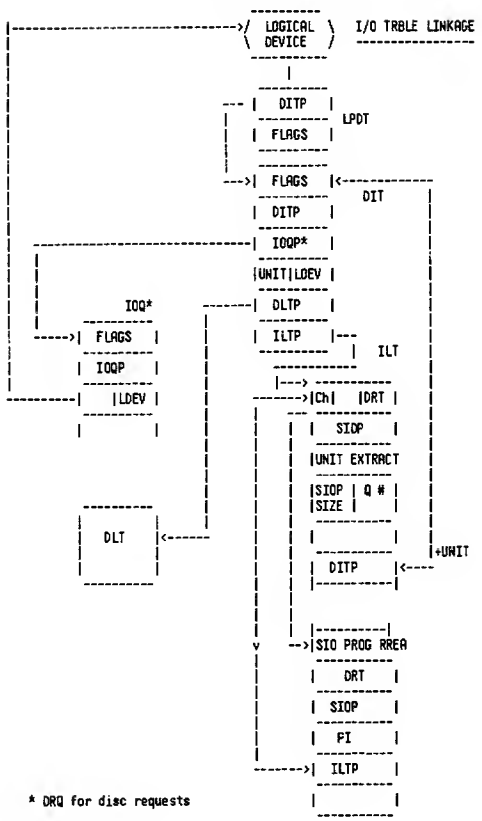


## Serial Disc Organization

The disc is organized as follows:

| | |
|---|---|
| Label sector | 0 See expanded view in Chapter 3. |
| DTT/DSCT | 1 DTT (MAC family) or DSCT (CS80). |
| Cold load | 2 HP-IB cold load channel prog. |
| Soft dump | 3 SOFTDUMP channel program. |
| Gap Table | 4 to STARTADDRESS - 1. |
| Data | STARTADDRESS |
| | to |
| | EOTSECTR |
| | to |
| Last data sector | EODSECTR |

CHAPTER 13 I/O
I/O Table Linkage

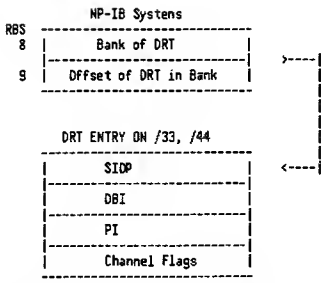



* DRQ for disc requests





Device Reference Table (DRT)

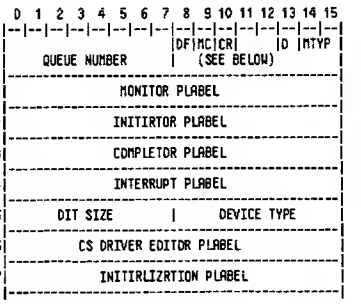



SIOP - absolute address of SIO program
PI - interrupt handler plabel
DBI - this is the absolute address of the ILT





Driver Linkage Table (DLT)




There is one DLT for each type of driver. A pointer in the DIT allows different devices on a controller to have different drivers and interrupt handlers.

DPROC.QNUMB - This field contains the I/O process request queue number for type 2 drivers. Zero for all other types.
.(8:1).DRVRFRZN (DF) - Driver code frozen. Set by MAM when then the driver code segment has been made present and frozen from a request from SIODM.
.(9:1).MRMERRORC (MC) - MAM Error on Code Makepresent
.(10:1).CORERES (CR) - If set both initiator and completor code are core resident.
.(14:2).DRVRTYPE (MTVP) - DRIVER/MONITOR TYPE
0 - not used
1 - driver can be executed on any stack
2 - driver can be executed in the user process or in the I/O process identified by IDNUMB
3 - run only in process whose PCB number is in IDNUMB

DMNTR - I/O Monitor Plabel.
DINIT - Driver Initiator Procedure Plabel.

DCOMP - Driver Completor Procedure Plabel.
DINTP - Special interrupt handler Plabel. This procedure is called by GIP if ISPEC is set DFLAG. No other action is taken by GIP except to set the Interrupt Status in DSTRT.
DTYPE.DITSIZE - The length of the DIT in words for this driver.





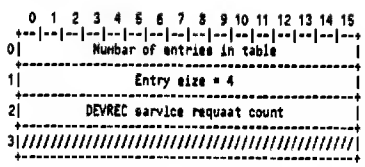
Logical-To-Physical Device Table (LPDT)

DST = 13 (= %15)
SIR = 9 (= %11)

The LPDT has several fields which describe the state of a device. Some of these fields have the same meaning for all devices. Others are device dependent. All are described below.

There are two types of devices represented in the LPDT: real devices and virtual devices. A real device is one which has been configured into the system and is capable of performing input and/or output. A virtual device simulates some of the properties of a real device (for example a spooled line printer or an INP), but there is no physical I/O involved. The two main uses for virtual devices are for OPEN spooled devicefiles and certain communication devices (such as INP's).
A given virtual device entry is in use only while the devicefile it represents is open. When the file is FCLOSEd, the entry becomes available for another virtual device. This is the reason for the SYSDUMP/INITIRL configurator question MAX # OF OPEN SPOOLFILES--it needs to know how many virtual device entries to allocate to the LPDT (and to the LOT).
Entries in the LPDT are ordered by logical device number. The first word address of a real device entry is obtained by multiplying the LDN by the entry size. Except for the 0th entry, entries for which no logical device is configured on a given system are used for virtual device entries. Any remaining virtual device entries follow the last real device entry.

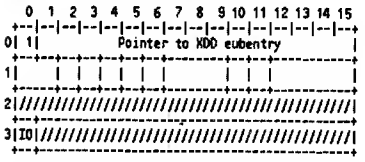
Entry 0




Discussion:
Word 2 is incremented by a device driver whenever it sets the Device Ownership State field (below) to 2 (Service Requested). DEVREC decrements the count for each interrupt it services until the count reaches 0, at which time DEVREC hibernates.

-- CAUTION --
Device drivers must lock this table by DISABLE/ENABLEing, -NOT- by trying to acquire the LPDT SIR.

Typical Entry (Virtual Devices)



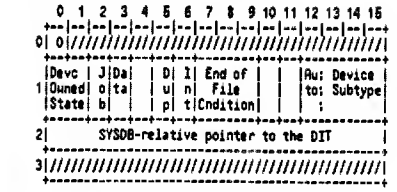

ID -- 0 for input, 1 for output.

Word 0, bit 0 is 1 for a virtual device, 0 for a real device. The fields in word 1 are the same, as applicable, as for the real device represented by a given virtual device. See below.





Typical Entry (All Real Devices)



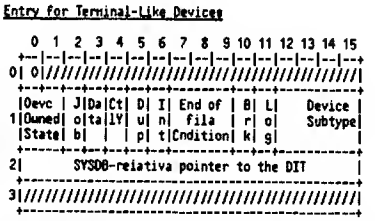

Discussion:
Word 1.( 0:2) -- Device Ownership State:
0 -- Not owned by any process.
1 -- Owned by a process.
2 -- Service requested. Set by driver for unexpected interrupt, then wakes DEVREC.
3 -- Service granted. Set by DEVREC. Logon sequence is 0-2-3-1.
3 -- Device reserved (alternate use). Set during STARTSPOOL, spooler process sets to 1 when it gets started.
Word 1.( 2:1) -- Device is Job/Session Accepting if true.
Word 1.( 3:1) -- Device is Data Accepting if true.
Word 1.( 5:1) -- Device is Duplicative if true (all devices except discs).
Word 1.( 6:1) -- Device is Interactive if true (all devices except discs).
Word 1.( 7:3) -- End of file condition:
0 -- No EOF detected.
1 -- Hardware EOF (e.g., tape mark).
2 -- :DATR record read.
3 -- :EOD record read.
4 -- :HELLO record read.
5 -- :BYE record read.
6 -- :JOB record read.
7 -- :EOJ record read.
Word 1.(12:4) -- Device subtype. See discussion for tape entry (below) for a description of the Auto bit (12:1).

The remaining bits in Word 1 are device-dependent and are described with their corresponding entry diagram.





Entry for Terminal-Like Devices

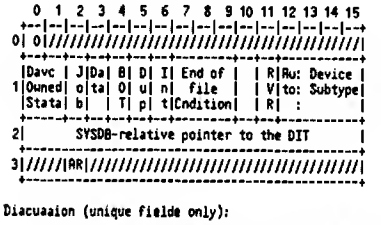



Discussion (unique fields only):
Word 1.( 4:1) -- CONTROL-Y is allowed and has been detected.

Word 1.(10:1) -- BREAK has been detected -OR- ignore BREAK if the C.I. is running.

Word 1.(11:1) -- The terminal is logging on. This bit is set by PROGEN and DEVREC when the logon sequence starts. If the bit is off when polled by INITJSMP, the terminal has disconnected. For now, only IOTERMO and HIDTERM support the use of this bit. Multipoint and DS pseudo-terminals do not.

Entry for Tape Drives




Discussion (unique fields only):

Word 1.( 4:1) -- BOT. Tape is at Load Point -OR- no tape mounted. Recording density may only be switched when this bit is true (for multiple density tape drives).

Word 1.(11:1) -- If true, DEVREC is performing Automatic Volume Recognition (AVR) on a tape (or PVPROC is doing the same on a serial disc), -OR- AVR is to be suppressed on job or data accepting devices.

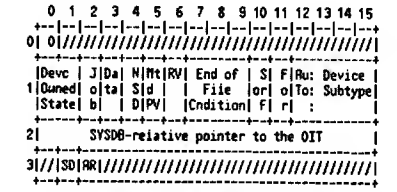




Word 1.(12:1) -- Part of Device Subtype field. If true, device may be allocated automatically when opened. If false, operator must allocate.

Word 3.(2:1) -- AUTO REPLY. Device may be allocated without prompting the operator for REPLY. This bit is set automatically if word 1 (12:1) is true.

Entry for Disc Drives




Discussion (unique fields only):
Word 1.( 0:2) -- Device Ownership State. May not be 1 (owned) for shared device (system volume or private volume). Serial and foreign discs are non-sharable and may be owned. See the full discussion of this field under Typical Entry, above.

Word 1.( 4:1) -- If true, the disc is a nonsystem domain (private volume, serial disc or foreign disc) disc drive.

Word 1.( 5:1) -- If true, disc is a mounted private volume.

Word 1.( 6:1) -- If true, the disc is a reserved volume used to satisfy the requirements of a multiple volume private volume set.

Word 1.(10:1) -- If true, the disc is a physically and logically mounted serial or foreign disc. Bits 5 and 6 must be false.

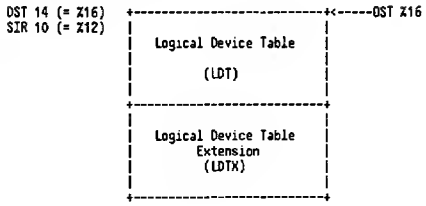
Word 1.(11:1) -- If bit 10 is true, then 1 ==> foreign disc, 0 ==> serial disc.

Word 3.( 1:1) -- If true, the device is currently being used as a serial disc (that is, it is allocated to a user as a serial disc). This bit duplicates a bit in the LDTX entry so that this information can be found in a system (memory-resident) table.

Word 3.(2:1) -- AUTO REPLY. Device may be allocated without prompting the operator for REPLY. This bit is set automatically if word 1 (12:1) is true.

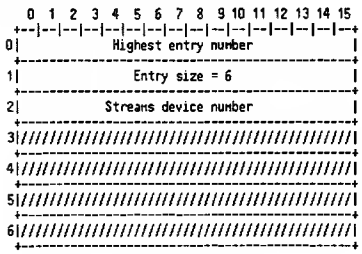
## Logical Device Table (LDT)

### Overview of Data Segment




Logical Device Table

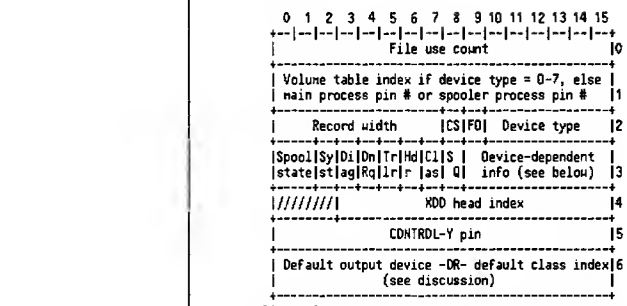
### Zero Entry Format








### Typical Entry Format




Discussion:

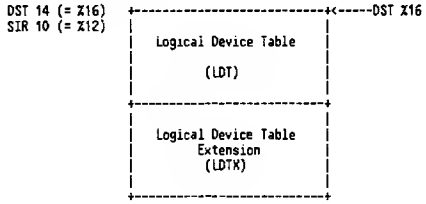
Word 2.(8:1) -- Communication system device if set.
Word 2.(9:1) -- If set, there are special forms mounted on the device.
Word 3.(0:2) -- Spooled state of the device:
0 -- Not spooled.
1 -- Owned by an input spooler.
2 -- Owned by an output spooler.
Word 3.(2:1) -- Device is available to systen (not down).
Word 3.(3:1) -- Device is available to diagnostics (obs).
Word 3.(4:1) -- :DOWN requested, honored when use count = 0.
Word 3.(5:1) -- If set, trailers are disabled.
Word 3.(6:1) -- If set, headers are disabled. These two bits are managed such that header/trailers are generated in pairs or not at all.
Word 3.(7:1) -- If I/O, word 6 is the Device Class Table index/LDEV# of the default output class/device associated with this device.
Word 3.(8:1) -- Spooling has been enabled (spool queues are open) for this device.
Word 3.(9:7) -- Device dependent information:
1. For terminal-like devices, the default terminal type to be used if not specified in the :HELLD command.
2. For variable density tape drives:
Word 3.(10:3) -- actual tape density.
Word 3.(13:3) -- density requested in FOPEN for writes to unlabelled tapes only.
For either:
0 = unknown density/no FOPEN w/ write.
1 = 1600 BPI
2 = 6250 BPI
3 = 800 BPI





## Logical Device Table Extension (LDTX)

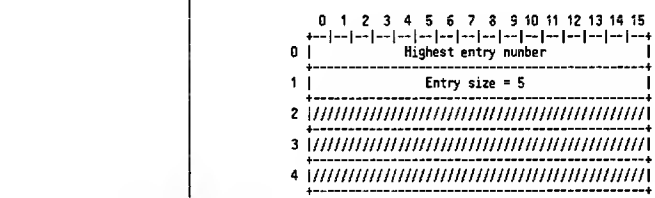
### Overview of Data Segment



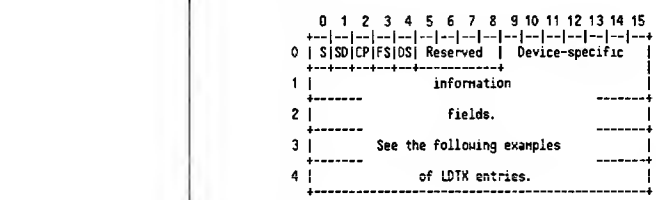





### Zero Entry



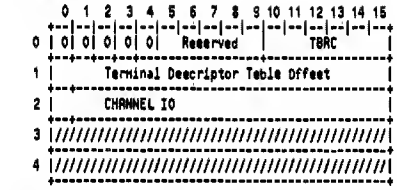

### Typical entry




Where:

S.....Seek ahead enable/disable flag (system or PV disc only).
SD....This logical device is a Serial Disc or a Foreign Disc.
CP....This logical device uses the CIPER protocol.
FS....This is a system or PV disc with Disc Free Space management.
DS....This LDEV is a DS or data communications device.

Terminal Entry




TBRC..Terminal'e baud rete code (CPS = characters per second).

| Speed (CPS) | ROCC/RTP (HPIB) TBRC |
|---|---|
| Not known | 0 |
| 1920 | 16 (RTP only) |
| 960 | 8 |
| 480 | 9 |
| 240 | 7 |
| 120 | 11 |
| 60 | 6 |
| 30 | 13 |
| 15 | 14 |
| 14 | --- |
| 10 | 15 |

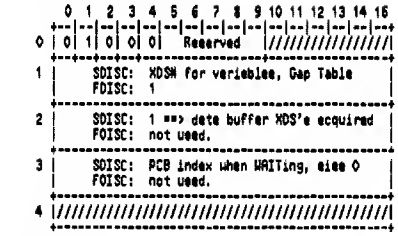
WS....This terminal is connected to a Worketation Configurator port.

TDT offeet...Offset fron the baee of the Terminal Descriptor Table (TDT) to the TDT entry for thie terminal. A -1 indicatee no TDT entry exiete for thie terminal.

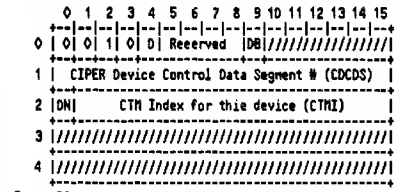




Serial or Foreign Disc Entry

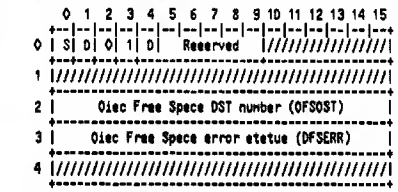



CIPER Entry




DB.....If eet to 1, then debugging is in effect.
DN.....If 1, the CIPER facility has been de-activated for thie device because of error.
CTMI...Controi Table Map Index (an index into the Control Tabie Map (CTM), which ie located in the CDCDS.

System or Private Volume Disc Entry



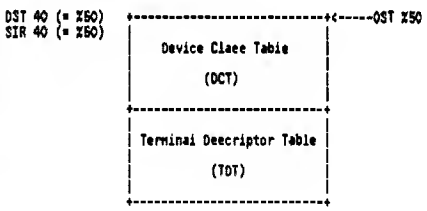

S.....Seek ahead enable/dieable flag.



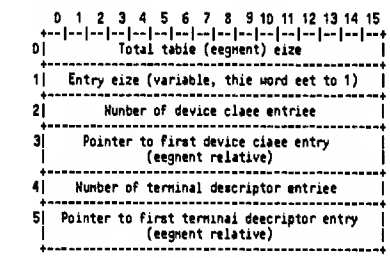


## Device Claee Table (DCT)

Overview of Data Segment



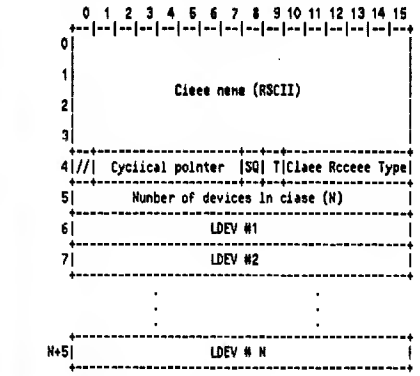

Header Entry Format








Device Claee Table Typical Entry Format




Discussion:

The Device Ciaee Tabie (DCT) containe a varying number of variable iength entriee. Thie ie because you may configure an arbitrary number of device claseee on a eyeten, and eech device cieee nay be conprieed of an arbitrary number of logicai devicee. There ie one DCT entry per device ciaee, and each DCT entry containe a iiet of logical devicee in the claee. There ie no eetablished order of entriee in the DCT, nor ie there an order of LDEVe within an entry.

Due to the haphazard nature of the DCT, its overaii propertiee are kept in the header entry. These inciude the eegnent-relative etarting address of the DCT (in caee the header entry should be expanded iater) and the number of entries in the table. A segment-relative pointer to the Terminal Descriptor Table (which foiiowe the DCT) may also be ueed to calculate the size of the DCT. Aleo note the "Entry eize" word. It ie meaninglese for thie table, but ie inciuded for compatibility with other fixed-length entry MPE tables.
Since the DCT entriee are of variable iength, when you want a particular entry you must aiwaye etart at the beginning of the DCT and iink through each entry until you find the one you're intereeted in.

A few of the fieide in the DCT require further deecription:

Word 4,( 1;7) --Cyclical pointe., Currently used only for system and private volume diec devicee. The pointer variee from 1 to N (number

of entries in the class) and indicates the LDEV# in the class list on which the last extent was allocated. The disc space allocation routines will try to satisfy the next request on the next disc drive indicated by the cyclical pointer (with wraparound to 1 if the pointer > N). If that fails, the pointer is incremented until space is found or all devices in the class have been tried.

Word 4.( 8:1) --If set, spooling has been enabled (spool queues opened) for this device class.

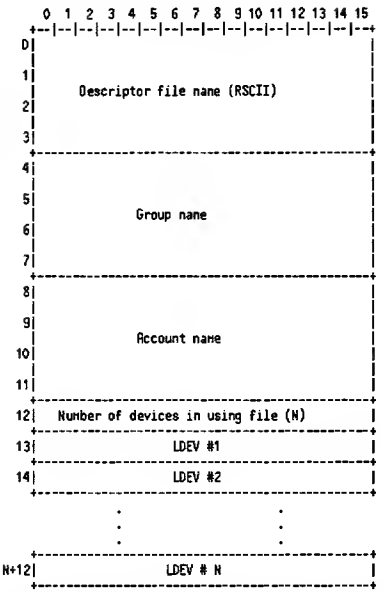
Word 4.( 9:1) --If set, the class is a terminal type class.

Word 4.(10:6) --Usually the same as the device type represented by the class (0-7 for disc, 24 for tape, 32 for printer, etc.). Serial disc classes are disc devices accessed as tape drives, so their true device types are kept in the LDT, while this field holds a special type (31, or %37), indicating a serial I/O (non-concurrent) device. Similarly, a foreign disc is a nonsharable disc drive, so that fact is reflected by a special type 7 in this field, even though the true harduare type is kept in the LDT, as for serial discs.





Terminal Descriptor Table Typical Entry Format

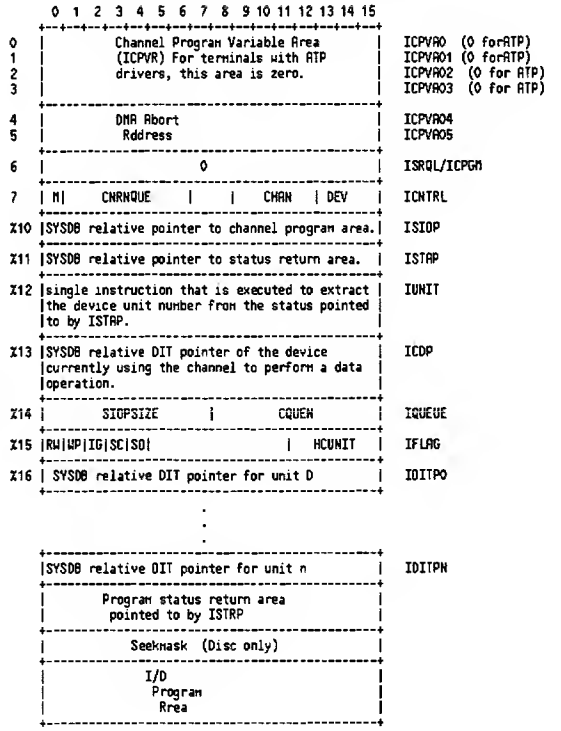



The Terminal Descriptor Table contains a varying number of variable length entries, because each Terminal Descriptor entry may have an arbitrary number of logical devices. However, you can only configure a fixed number of valid terminal entry files. These are the TTnn or TTPCLnn files which reside in PUB.SYS.





Interrupt Linkage Table (ILT) for NP-I8 Systems








ILT (Cont.)

IPCVR - These four words comprise the channel program variable area where information is stored concerning a channel program Interrupt instruction or abort. CPVA0 should be used only for channel program aborts.

ICPVA4 - Words 4 and 5 contain DMA address, when channel program aborts during DMA transfer.

ISRQL - Serial poll request queue length. NP-I8 Systems do not support any serial poll devices. This should always be zero.

ICPGM - This is the SYSDB relative address of the channel program to be started for this device after receiving a NIOP interrupt in GIP. GIP will call STRRTIO when the flags word indicates "ignore halt interrupt" and "start channel program" bits are set.

ICNTRL - Contains controller information.

.M If set, the controller is sharing a software channel resource in order to limit bandwidth.

.CHNO The software channel resource number.

.DRTN The DRT number for a Series 33 device is equivalent to:
.CHRN - channel number (4 most significant bits of DRTN)
.DEV - device number (3 least significant bits of DRTN)

IFLAG - Used for controller flags.

.RW Runwait flag. An idle channel program should be started when there are no active requests to process.

.WP Waitprog flag. An idle channel program has been started for this controller. This bit is reset by an interrupt.

.IG Ignorehi flag. An HIDP instruction has been issued against this controller, but the channel program was not in a wait statement. Therefore, ignore the interrupt generated by the channel code when this program halts.

.SC Start channel program flag. When set along with the IG flag, GIP will start a previously attempted SIOP on this device.

.SQ Start channel program "queued" flag. When bit SC is set, this bit will determine if the call to START'NPIB will have logical parameter QUEUED true or false.

.HCUNIT Highest configured unit number for this controller.

## Device Information Table (DIT)

There is one DIT per physical device. If a physical device represents represents more than one logical device, the logical device number is obtained from the I/O queue element. Although details of DIT's vary with device, the following structure is common to all:

### DIT for MP-IB Systems

```
   0  1  2  3  4  5  6  7  8  9  10 11 12 13 14 15
 +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
0|T |D |AC|RQ|SI|MU| 0|IO|IA|NO|ST|NS|  STATE    |  DFLAG
 +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
1|SYSDB relative pointer to the DIT for the next  |  DLINK
 |   device requesting this resource or service    |
 +-------------------------------------------------+
2|SYSDB relative pointer to the first IOQ in       |  DIOQP
 | request list for this device                    |
 +-------------------------------------------------+
3|            Logical device number                |  DLDEV
 +-------------------------------------------------+
4|SYSDB relative pointer to Device Linkage Table   |  DDLTP
 +-------------------------------------------------+
5|SYSDB relative pntr to Interrupt Linkage Table   |  DILTP
 +-------------------------------------------------+
6|      Controller Hardware Status                 |  DSTRT
 +-------------------------------------------------+
7|Hardware error status.  Set when the driver      |  DSERR
 | detects an error.  Whenever <>0, the driver     |
 | monitor logs an I/O error and clears this word  |
 +-------------------------------------------------+
8|        Device Dependent Area                    |  (DTIME)
 +-------------------------------------------------+
9|        Device Dependent Area                    |  (DTRQX)
 +-------------------------------------------------+
10| IOT |//////////////////|     Phys. unit #       |  DUNIT
  +-----+------------------+------------------------+
```

DTRQX  Used by some device drivers, it denotes timer request index.





### DIT Terminology for MP-IB Systems

```
DFLAG - DEVICE RELATIVE FLAGS
 T    SET IF DEVICE IS A TERMINAL.
 D    SET IF DEVICE IS A DISC.
 AC   ACTIVE BIT. 1 IMPLIES A MONITOR CURRENTLY SERVICING
      THIS DEVICE.
 RQ   REQUEST BIT. 1 IMPLIES SERVICE REQUESTED WHILE
      MONITOR IS ACTIVE.
 MU   IF SET, MULTIPLE UNIT CONTROLLER.
 IO   IF SET, THEN A CHANNEL PROGRAM IS CURRENTLY EXECUTING.
 IR   IF SET, AN INTERRUPT OR RESPONSE WAS OCCURRED.
 NO   IF SET, DEVICE IS IN A NOT READY OR OPERATOR WAIT.
 ST   IF SET, AN IDLE CHANNEL PROGRAM SHOULD BE STARTED FOR
      THIS DEVICE.
 SI   SPECIAL INTERRUPT HANDLER
 NS   DO NOT SHORT WAIT THIS DISC
 STATE CURRENT DRIVER STATE AS DEFINED BY THE MONITOR.
       ALLOWABLE STATES ARE:
        0 - START REQUEST
        1 - NOT USED (BUT RESERVED)
        2 - CALL DRIVER INITIATOR
        3 - CALL DRIVER COMPLETOR
        4 - NOT USED (BUT RESERVED)
        5 - COMPLETE REQUEST
        6 - UNEXPECTED INTERRUPT OCCURRED
        7 - START OPERATOR INTERVENTION WAIT
       X10 - WAITING (ON OPERATOR). RESTART AT 0
       X11 - WAITING (DATA MAKEPRESENT/FREEZING)
       X12 - WAITING (INITIATOR CODE MAKEPRESENT/FREEZE)
       X13 - WAITING (FOR COMPLETION INTERRUPT)
       X14 - WAITING (FOR DEVICE CONTROLLER AVAILABILITY)
       X15 - NOT USED (BUT RESERVED)
       X16 - WAITING (INITIATOR CODE MAKEPRESENT)
       X17 - WAITING (COMPLETOR CODE MAKEPRESENT)
IOT - I/O System type  0-Series II/III I/O System
                       1-HP-IB Systems
                       2-unused
                       3-unused
```

### Device Information Table (DIT) for CIPER

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IOQ element (however, this driver only supports one device per controller.) The following diagram shows the DIT used for the HP-IB CIPER physical driver.





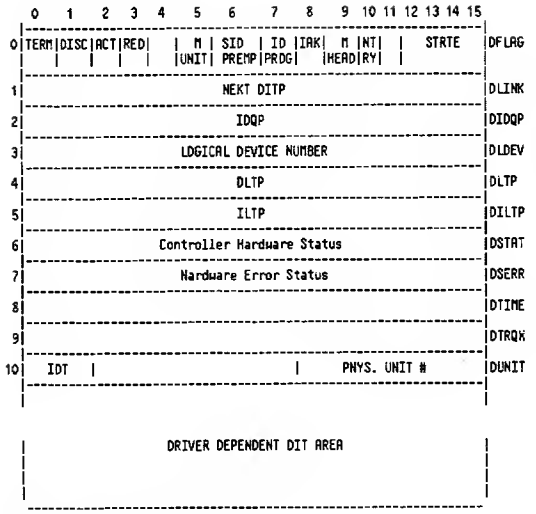
```
   0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15   MNEMONIC
 +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
0| 0| 0|RC|RQ| 0| 0| 0|IO|IR|NO|ST| 0|   STATE   |  DFLAG
 +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
1| SYSDB relative pointer to the DIT for the next  |  DLINK
 | device requesting this resource or service      |
 +-------------------------------------------------+
2| IOQ table index to the first IOQ in             |  DIOQP
 | request list for this device                    |
 +-----+-----------------+-------------------------+
3| IOT |    Phys. unit # | Logical device number   |  DLDEV
 +-----+-----------------+-------------------------+
4| SYSDB relative pointer to Device Linkage Table  |  DDLTP
 +-------------------------------------------------+
5| SYSDB relative pointer to Intrp Linkage Table   |  DILTP
 +--+--+--+--+--+--------+----------------------+--+
6|VS|AB|RE|TP|NR| NR CNT |     DEVICE STATUS    |  DSAVE
 +--+--+--+--+--+--------+----------------------+--+
7| Hardware error status.  Set when the driver     |  DSEAA
 | detects an error.  Whenever <>0, the driver     |
 | monitor logs an I/O error and clears this word  |
 +-------------------------------------------------+
X10| Bit 0 is set at completion of timer          |  DTIME
 +-------------------------------------------------+
X11| Holds the time out request entry index while |  DRQST
 | a timer is active.                              |
 +--+--+--+--+--------+--------+--------+--------+
X12|AF|UE|DE|TO|UNIT CNT|DATA CNT| TO CNT |PRTY CNT|  DCOUNTS
 +--+--+--+--+--------+--------+--------+--------+
X13|          Error logging location #1           |  DLOGEAROA
 +----------------------------------------------+
X14|          Error logging location #2           |  DLOGCOUNT
 +----------------------------------------------+

DFLAG - Flags and request state
  AC  ACTIVE  - A monitor is currently servicing this device.
  RQ  REQUEST - A service request is pending while the monitor is
                active.
  IO  IOPROG  - An I/O Channel Program is running for this device.
  IR  IRAK    - An interrupt or response has occurred for this device.
  NO  NOTRDY  - Go to state X10 after Idle Channel Program is started.
  ST  STWAIT  - The device monitor is starting an Idle Channel Program
                for this device.  There is no IOQ associated with this
                type of request.
  STATE       - State of the device monitor.  Specifies the next action
                to be taken in SIOOH in servicing the request:
                  0 - start new request
                  1 - not used
                  2 - call driver initiator procedure
                  3 - call driver completor procedure
                  4 - not used
                  5 - process request completed
                  6 - initiate device recognition sequence
                  7 - start operator intervention wait
```





```
                X10 - wait for interrupt (operator intervention)
                      restart at state 0
                X11 - wait for data segment freeze, then state 2
                X12 - wait for driver initiator to be frozen, then
                      allocate controller (state 2)
                X13 - wait for I/O completion interrupt, then state 3
                X14 - wait for controller, then call driver initiator
                X15 - not used
                X16 - wait for initiator make present, then state 2
                X17 - wait for completor make present, then state 3

DLDEV - I/O system type, unit and logical device number
    0 - HP3000 Series III/III
    1 - HP 3000 MP-IB
    2 - Unused
    3 - Unused

DSAVE - Device processing flags
  VS - VALID STATUS - Set to indicate Device Status has been updated.
  AB - DVAABFLAG    - Sequence Abort in progress due to ABORT request.
  RE - RETRYFLAG    - Sequence Abort in progress due to an error.
  TP - TIMERPOPPED  - Current error is due to software timer popping.
  NA - NOTRDYFLAG   - Not Ready Wait in progress.
  NR CNT            - Number of Not Ready Waits during this request.
  DEVICE STATUS     - Device status returned during a Sequence Abort.
        BIT  8      -   CAC available and enabled.
             9      -   Reserved.
             10     -   Reserved.
             11     -   Reserved.
             12     -   Power fail or reset has occurred.
             13     -   A protocol error has been detected.
             14     -   A parity error has been detected.
             15     -   The peripheral has data to send.

DSEAA - Pointer to status to be logged.
        Bits(0:8)   - Number of words to be logged.
        Bits(8:8)   - Offset relative to DITP(0).

DCOUNTS             - Error flags and error counts (4).
   RF - RED FAILED  - An error has forced this request to be aborted.
   UE - UNIT ERROR  - The current error is a Unit Error.
   DE - DATA ERROR  - The current error is a Data Error.
   TO - TIME OUT    - The current error is a GIC Time Out Error.
   UNIT CNT         - Number of Unit Errors during this request.
   DATA CNT         - Number of Data Errors during this request.
   TO CNT           - Number of GIC Time Outs during this request.
   PRTY CNT         - Number of MP-IB Parity Errors during this request.
```

DIT for Channel Devices




DFLAG.TERMINAL - Device is a terminal
.DISC - Device is a Disc (Bit 0 = 0)
.ACTIVE - R monitor is currently servicing this device
.REQUEST - Service requested while monitor was active

.MUNIT - device controller servicing multiple units
.SIOPREMPT- If set then a request has been queued for this device. Preempt code is set in IDQ.
.IDPRDG - I/O program in progress. Decrement SIDCOUNT and check for multi-channel when complete
.IAK - Interrupt or Response has occurred.
.M HEAD -Moving head disc
.NT RDY -Not ready for SIO. SIDDM holds off next SID until ALLDWPDLL is done.

DTRQX - Used by some device drivers, it denotes timer request index.





DIT for Channel Devices (Cont.)

DFLAG.STATE - this quantity specifies the next action to be taken in servicing the request.

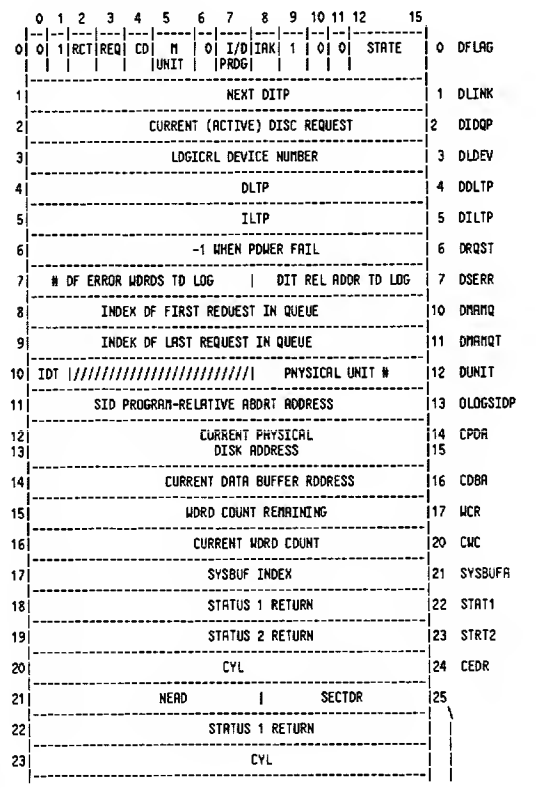
0-new - start request.
1-not used.
2-call Driver Initiator Procedure
3-call Driver Completor Procedure
5-complete request
6-device recognition
7-start operator intervention wait (%10)
%10-restart request on interrupt
%11-wait for data to be frozen then state 2
%12-wait for driver code to be frozen then state 2
%13-call completor on interrupt
%14-wait for device controller
%15-not used
%16-wait for initiator make present then state 2
%17-wait for completor make present then state 3

DLINK - SYSDB relative pointer to the DIT for the next device requesting this resource or service.
DIDQP - SYSDB relative pointer to the first IOQ in the request list for this device
DLDEV.LDEVN - Logical Device Number
.UNIT - unit number of the physical device.
.IDT - ID type 0=> Series III I/O, 1=> HPIB I/O
DDLTP - SYSDB relative pointer to the DLT.
DILTP - SYSDB relative pointer to the ILT.
DSTAT - interrupt status for this device. Set each time the device interrupts.
DSERR - Hardware Device Controller Status. Set when the driver detects an error. Whenever not zero, SIDDB logs an I/O error and clears this word.
DTIME - time out completed flags. If a timeout occurs in response to a timer request type %20 (I/O request), the sign bit is set in this word. The IR bit in DFLAG is also set, and the monitor for this device is awakened. (Only used if timer services are requested. Must be word #8 if timer services are requested.)





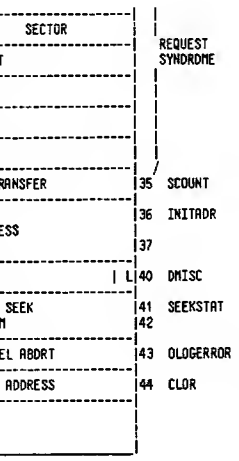
DIT For 7905/7906/7920/7925







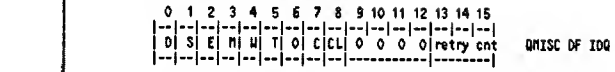

DIT for 7905/7906/7920/7925 (Cont.)




DMISC
(15:1) L'STAT'ERR - 1 Last transfer ended in error.

IOT - I/O Devices
0 - non-HP-IB
1 - HP-IB Systems
2 - unused
3 - unused

Error and Retry Information




D - retry determination
S - request syndrone
E - request error information
M - update track nap
W - writing track nap
C - issued a recalibration
CL- driver issuing channel clear
T - timeout wait

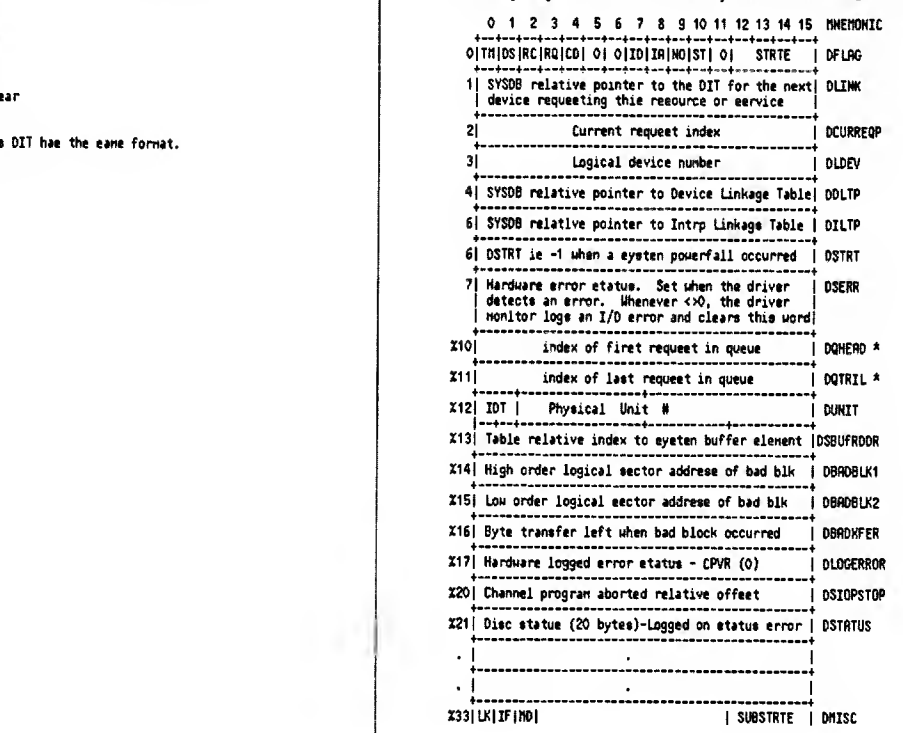
NOTE: Integrated Cartridge Tape's DIT has the same format.





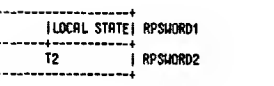
CS 80 Disc Device Information Table (DIT)

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IDQ element. For the CS'80 disc controller, there will only be one device. The following diagram shows the DIT used by the CS'80 disc driver.








DFLAG - flags and request state

TM TERM - Set if device is a terminal.
DS DISC - If TM = 0 and this bit is set then the device is a disc, otherwise device dependent.
AC ACTIVE - R monitor is currently servicing this device.
RQ REQUEST - R service request is pending while the monitor is active.
ID IOPRDG - Rn I/O Channel Program is running for this device.
IR IRK - An interrupt or response has occurred for this device.
NO NOTRDY - Go to state X10 after Idle Channel Program is started.
ST STWAIT - The device monitor is starting an Idle Channel Program for this device. There is no IDQ associated with this type of request.
STRTE - State of the device monitor. Specifies the next action to be taken in SIODM in servicing the request:

0 - start new request
1 - not used
2 - call driver initiator procedure
3 - call driver completor procedure
4 - not used
5 - process request completed
6 - initiate device recognition sequence
7 - start operator intervention wait
X10 - wait for interrupt (operator intervention) restart at state 0
X11 - wait for data segment freeze, then state 2
X12 - wait for driver initiator to be frozen, then allocate controller (state 2)
X13 - wait for I/O completion interrupt, then state 3
X14 - wait for controller, then call driver initiator
X15 - not used
X16 - wait for initiator make present, then state 2
X17 - wait for completor make present, then state 3

DLINK - A SYSDB relative pointer to the next DIT requesting this resource or service.

DCURREQP - P current request sysbase index.

DUNIT.(0:2) - I/O system type

0 - non-HP-IB
1 - HP3000 HP-IB Systems
2 - Unused
3 - Unused





DLDEV - Logical device number of this device.

DSTRT - Set to a -1 when a system powerfail has occurred.

DSERR - Pointer to status to be logged.

Bits(0:7) - Number of words to be logged.
Bits(8:15) - Offset relative to DITP(0).

DMISC - Device dependent processing flags

LOCK'FLG - Lock flag denoting unload status of the disc volume.

0 - Allow operator unload to the volume.
1 - Deny operator unload to the volume.

IGNORE'INT'FLG - Ignore unexpected interrupt flag.

SUBSTRTE - Indicates state of the idle channel program:

0 - Normal idle channel program wait
1 - Idle request being serviced wait

DSBUFRDDR - SYSDB relative pointer to the system buffer element used to read the DSCT. Zero, if no element gotten.

DBRDBLK1 - High order logical sector address of the bad block for the Defective Sector Table (DSCT) entry.

DBRDBLK2 - Low order logical sector address of the bad block for the DSCT entry.

DBADXFER - Byte transfer left when bad block occurred.

DLOGERROR - CPVR(0) logged on hardware error status.

DSIOPSTOP - Stopped channel program relative offset location due to an error in CPVR(0).

DSTATUS - 20 bytes disc status logged on status error. (See CS'80 Disc Drive Status).

RPSWORD1 - Flags and local state

RE - Read revision code done.
Set if read revision code level is done.
DC - RPS revision code.
Set if controller is "PEP"ed.
DR - RPS desirable.
Set if RPS is desirable.
EN - RPS enabled.
Set if default value for RPS is enabled.
MR - Driver is processing a marginal data error

from the drive. Do not return hard error.
Local State - State of the local request made by driver

0 - No local request is being processed
1 - Reading rev code
2 - Setting default RPS

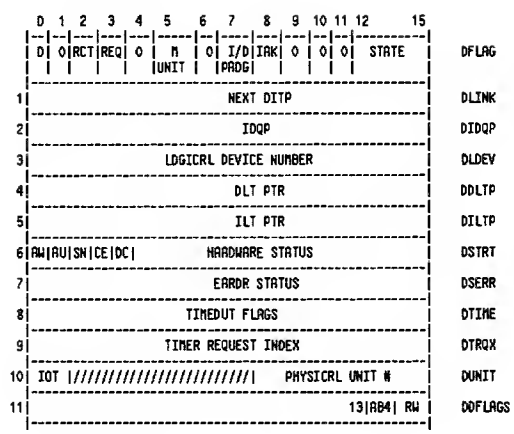
RPSWDRD2 - Default value for RPS

T1 - Time to target in hundreds of microseconds
T2 - Window size in hundreds of microseconds





DIT For 7970 Magnetic Tape



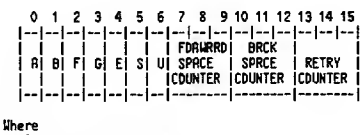

IDT - I/O Devices
0 - non-HP-IB
1 - HP-IB Systems
3 - unused
4 - unused

DSAVE - Device processing flags.
RW RWBIT - Indicates tape has been rewound.
AU RWUNLD - Indicates that a rewind/unload was performed to allow a write-ring mount.
SN SNDAT - A short read is in progress. After completion of read, EOF is checked for and if not present, the requested bytes are transferred from the short-read buffer to the user's buffer.
CE CESTAT - Channel parity error processing is in progress.
DC DSFLAG - Transfer used data chaining - used for computing the transmission log.
RW - (DDFLAGS, bit 15) if set, tape is rewound.
AB4 - (bit 14) if set, need to rewind tape before next write.





QMISC



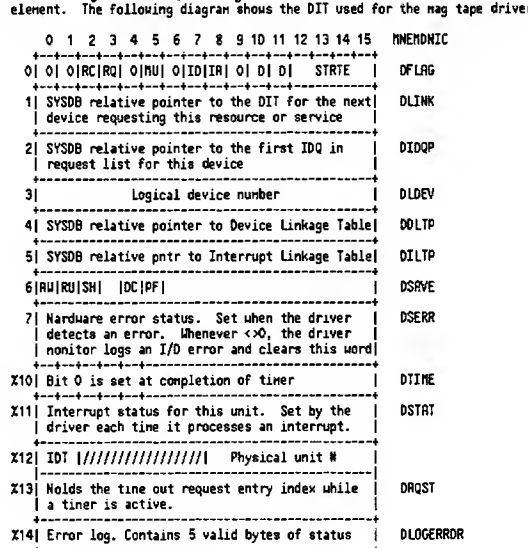

Where
A - retry in progress
B - backspace in progress
F - forward space in progress
G - gap in progress
E - backspace on data end-of-file
S - short read in progress
U - unload tape for write ring installation





DIT for 7976 Magnetic Tape

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IDQ element. The following diagram shows the DIT used for the mag tape driver.




DFLAG - Flags and request state
AC ACTIVE - A monitor is currently servicing this device.
RQ REQUEST - A service request is pending while the monitor is active.
MU MUNIT - This device is on a multi-unit controller.
ID IDPROG - An I/O Channel Program is running for this device.
IR IRK - An interrupt or response has occurred for this device.
ND NDTRDY - Go to state X10 after Idle Channel Program is started.
ST STWRIT - The device monitor is starting an Idle Channel Program for this device. There is no IDQ associated with this type of request.

```
  STRTE      - State of the device monitor.  Specifies the next action
               to be taken in SIODM in servicing the request:
                 0 - start new request
                 1 - not used
                 2 - call driver initiator procedure
                 3 - call driver completor procedure
                 4 - not used
                 5 - process request completed
                 6 - initiate device recognition sequence
                 7 - start operator intervention wait
               X10 - wait for interrupt (operator intervention)
                     restart at state 0
               X11 - wait for data segment freeze, then state 2
               X12 - wait for driver initiator to be frozen, then
                     allocate controller (state 2)
               X13 - wait for I/O completion interrupt, then state 3
               X14 - wait for controller, then call driver initiator
               X15 - not used
               X16 - wait for initiator make present, then state 2
               X17 - wait for completor make present, then state 3


OSAVE - Device processing flags
  RW  RWBIT  - Indicates tape has been rewound.
  RU  RWUNLD - Indicates that a rewind/unload was performed to allow a
               write-ring mount.
  SH  SHORT  - A short read is in progress.  After completion of read,
               EOF is checked for and if not present, the requested
               bytes are transferred from the short-read buffer to the
               user's buffer.

  DC  DSFLAG - Transfer used data chaining - used for computing the
               transmission log.
  PF  POWER  - Device power up indication.
```



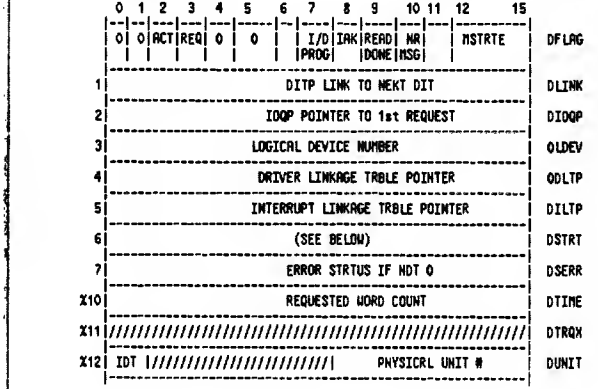


```
DSTRT - Mag tape controller status

  BITS        USE

   0     END OF FILE (EOF)

   1     BEGINNING OF TAPE (BOT) / LOAD POINT (LP)
   2     END OF TAPE (EOT)
   3     SINGLE TRACK ERROR (NOT LOGGED FOR RERDS)

   4     COMMAND REJECT (REJECT)
   5     FILE PROTECT (NOT WRITE ENABLED; NO WRITE RING)
   6     MULTIPLE TRACK ERROR (MTE)

   7     UNIT ONLINE
   8     GCR (6250 BPI DENSITY)
   9     UNIT NUMBER (MSB)

  10     UNIT NUMBER (LSB)
  11     TIMING ERROR
  12     TAPE RUNAWAY

  13     REWINDING       *
  14     UNIT BUSY       **  (REPORTED AS UNIT NOT READY)
  15     INTERFACE BUSY  *
```





Card Reader DIT




```
DSTRT bits:


BIT0=SIO OK
BIT1=0
BIT2=INT PENDING
BIT3=TIMING ERROR
BIT4=LIGHT DARK CHECK
BITS 5-6 =    00 COLUMN BINARY MODE
              01 UNUSED
              10 PACKED BINARY MODE
              11 HOLLERITH-TO-RSCII MODE
BIT7=COMPARE ERROR
BIT8=EOF DETECTED
BITS 9-10 =   00 NORMAL
              01 HOPPER EMPTY
              10 UNUSED
              11 STACKER FULL
BIT11=INVALID HOLLERITH
BIT12=PICK FAIL OR MOTOR CHECK
BIT13=TEST
BIT14=TROUBLE
BIT15=NOT READY
```





Card Reader DIT Field Definitions

DFLAG - Flags and device stats

| | |
|---|---|
| ACTIVE | Monitor is currently active servicing this device. |
| REQUEST | Service for this device was requested while the monitor was active. |
| IOPROG | SIO program in progress. |
| IAK | Interrupt occurred or request aborted or preempted. |
| READDONE | Previous read resulted in an EOF with a backup save requested. The data has been saved in an auxiliary buffer and will be passed back on the next read request. |
| NRMESSAGE | Set when a not ready message has been issued, and cleared when the reader is found ready. Used to prevent multiple Not Ready messages when power is turned on. |
| MSTATE | Monitor State. See SIODM specifications for details. |

DLINK - SYSDB relative pointer to the DIT for the next device requesting service for this resource.

DIOQP - SYSDB relative pointer to the first IOQ element in the request list for this device.

DLDEV - Logical device number and unit number.

| | |
|---|---|
| UNIT | Unit number of device. |
| LDEVN | Logical device number. |

DDLTP - SYSDB relative pointer to driver linkage table (DLT).

DSTRT - Device interrupt status. Contains the device interrupt status at the last interrupt. See hardware ERS for details.
DSERR - Device interrupt error status. If not zero, then holds the device interrupt status from an operation with an erroneous completion status. Causes SIODM to log an error.

DWCNT - Holds the requested transfer count in words.

Device Information Table for HP-IB Card Reader

There is one DIT per physical device. If a physical device represents more then one logical device, the logical device number is obtained from the IOQ element. The following diagram shows the DIT used for the card reader driver.

```
    0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15   MNEMONIC
  +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
 0| 0| 0|RC|RQ| 0|MU| 0|IO|IR|NO|ST| 0|   STRTE   |   DFLAG
  +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
 1| SYSGB relative pointer to the DIT for the next|   DLINK
  | device requesting this resource or service    |
  +-----------------------------------------------+
 2| IOQ table relative index to the first IOQ in  |   DIOQP
  | request list for this device                  |
  +--------+--------------+-----------------------+
 3|              Logical device number            |   DLDEV
  +--------+--------------+-----------------------+
 4| SYSGB relative pointer to Device Linkage Table|   DDLTP
  +-----------------------------------------------+
 5| SYSGB relative pntr to Interrupt Linkage Table|   DILTP
  +-----------------------------------------------+
 6|RO|RF|                                         |   DSAVE
  +-----------------------------------------------+
 7| Hardware error status.  Set when the driver   |   DSERR
  | detects an error.  Whenever <>0, the driver   |
  | monitor logs an I/O error and clears this word|
  +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
X10| Not Used                                    |   DTIME
  +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
X11|              Request word count               |   DWCNT
  +-----------------------------------------------+
X12| IOT |//////////////////|     Physical unit #   |   DUNIT
  |-----------------------------------------------|
X13| Device Status.  Read from device during       |   DSTRT
  | each execution of the channel program.        |
  +-----------------------------------------------+
X14| Logging will be done from here.               |   DLOGERROR
  +-----------------------------------------------+
```

DFLAG - Flags and request state
- RC RCTIVE - R monitor is currently servicing this device.
- RQ REQUEST - R service request is pending while the monitor is active.
- MU MUNIT - This device is on a multi-unit controller.
- IO IOPROG - An I/O Channel Program is running for this device.
- IR IRK - An interrupt or response has occurred for this device.
- NO NOTROY - Go to state X10 after Idle Channel Program is started.
- ST STWRIT - The device monitor is starting an Idle Channel Program for this device. There is no IOQ associated with this type of request.





STRTE - State of the device monitor. Specifies the next action to be taken in SIODM in servicing the request:
- 0 - start new request
- 1 - not used
- 2 - call driver initiator procedure
- 3 - call driver completor procedure
- 4 - not used
- 5 - process request completed
- 6 - initiate device recognition sequence
- 7 - start operator intervention wait
- X10 - wait for interrupt (operator intervention) restart at state 0
- X11 - wait for data segment freeze, then state 2
- X12 - wait for driver initiator to be frozen, then allocate controller (state 2)
- X13 - wait for I/O completion interrupt, then state 3
- X14 - wait for controller, then call driver initiator
- X15 - not used
- X16 - wait for initiator make present, then state 2
- X17 - wait for completor make present, then state 3

DLDEV - Device logical device number
IOT I/O TYPE - I/O System type
- 0 = Series II / III I/O system
- 1 = HP-IB Systems
- 2 = unused
- 3 = unused

DSAVE - Device processing flags
- RO REROOONE - R card has already been read.
- RF RBORTFLAG - R device clear has already been sent for this series of aborted IOQs.





2608 Line Printer DIT (HP-IB Systems)

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IOQ element (however, there is only one device per 2608 controller.) The following diagram shows the DIT used for the 2608 line printer driver.

```
    0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15   MNEMONIC
  +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
 0| 0| 0|RC|RO| 0| 0| 0|IO|IR|NO|ST| 0|   STRTE   |   DFLAG
  +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
 1| SYSGB relative pointer to the DIT for the next|   DLINK
  | device requesting this resource or service    |
  +-----------------------------------------------+
 2| IOQ table relative index to the first IOQ in  |   DIOQP
  | request list for this device                  |
  +--------+--------------+-----------------------+
 3|              Logical device number            |   DLDEV
  +--------+--------------+-----------------------+
 4| SYSGB relative pointer to Device Linkage Table|   DDLTP
  +-----------------------------------------------+
 5| SYSGB relative pntr to Interrupt Linkage Table|   DILTP
  +-----------------------------------------------+
 6|VM|     |    TAB    |                |PS|FL|TP|   DSAVE
  +-----------------------------------------------+
 7| Hardware error pointer. Set when the driver   |   DSERR
  | detects an error.  Whenever <>0, the driver   |
  | monitor logs an I/O error and clears this word|
  +--+-----+----------+----------------+--+--+--+
X10| Bit 0 is set at completion of timer           |   DTIME
  +--+-----+----------+----------------+--+--+--+
X11| Holds the time out request entry index while  |   DRQST
  | a timer is active.                            |
  +-----------------------------------------------+
X12| IOT |//////////////////|     Physical Unit #   |   DUNIT
  +-----------------------------------------------+
X13|          Hardware logged error status         |   DLOGERROR
  +-----------------------------------------------+
```

DFLAG - Flags and request state
- RC RCTIVE - A monitor is currently servicing this device.
- RO REQUEST - R service request is pending while the monitor is active.
- IO IOPROG - An I/O Channel Program is running for this device.
- IR IRK - An interrupt or response has occurred for this device.
- NO NOTROY - Go to state X10 after Idle Channel Program is started.
- ST STWRIT - The device monitor is starting an Idle Channel Program for this device. There is no IOQ associated with this type of request.





STRTE - State of the device monitor. Specifies the next action to be taken in SIODM in servicing the request:
- 0 - start new request
- 1 - not used
- 2 - call driver initiator procedure
- 3 - call driver completor procedure
- 4 - not used
- 5 - process request completed
- 6 - initiate device recognition sequence
- 7 - etert operator intervention wait
- X10 - wait for interrupt (operator intervention) restart at state 0
- X11 - wait for data segment freeze, then stete 2
- X12 - wait for driver initiator to be frozen, then allocate controller (state 2)
- X13 - wait for I/O completion interrupt, then stete 3
- X14 - wait for controller, then call driver initiator
- X15 - not used
- X16 - wait for initiator make present, then state 2
- X17 - wait for completor make present, then state 3

DLDEV - I/O system type, unit and logical device number
IOT I/O TYPE- Type of I/O system
- 0 - HP3000 Series II/III
- 1 - HP3000 HP-IB Systems
- 2 - unused
- 3 - unused

DSAVE - Device processing flags
- VM VFCMOD - VFC has been modified.
- TRB TRBOFRULT - System tab default.
- PS PRESPRCE - Last request used prespacing.
- FL FULL - Line printer buffer is full.
- TP TOP - Printer is at top of form

2608 Line Printer Status

```
BYTE 1 & BYTE 2:
BITS        USE

  0     ON LINE

  1     NOT READY
  2     VFC CHANNEL 9 (BOTTOM OF FORM)
  3     VFC CHANNEL 12 (TOP OF FORM)

  4     VFC INITIALIZED
  5     6/8 LINES PER INCH
  6     (NOT USED)

  7     POWER RESTORED/UNIT RESET
  8     OH LINE
  9     PRINT MECH ERROR

 10     SELF TEST FRILURE
 11     PAPER ERROR
 12     SELF TEST MODE

 13     6/8 LPI
 14     PLATEN/RIBBON ERROR
 15     (NOT USED)

BYTE  3:  PRINT MODE
          BITS 0-7  MODE NUMBER
BYTE  4:  PRIMARY/SECONDARY
          BITS 0-3  SECONDARY CHARACTER SET CODE
          BITS 4-7  PRIMARY CHARRCTER SET CODE
BYTE  5:  SELF TEST
          BITS 0    PRSS fRIL
          BITS 1-7  SUBTEST NUMBER
BYTE  6:  6 LPI DOT ROW COUNT
BYTE  7:  6 LPI FORM LINE NUMBER
BYTE  8:  6 LPI FORM LENGTH IN LINES
BYTE  9:  8 LPI DOT ROW COUNT
BYTE 10:  8 LPI FORM LINE NUMBER
BYTE 11:  8 LPI FORM LENGTH IN LINES
BYTE 12:  FIRMWARE IDENTIFICRTION CODE
BYTE 20:  POWER-UP LANGUAGE
          BITS 0-3  SECONDARY CHARACTER SET CODE
          BITS 4-7  PRIMARY CHARACTER SET CODE
```





HP 2619R or 2613 Line Printer DIT (HP-IB Systems)

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IDQ element (however, there is only one device per 2631 controller.) The following diagram shows the DIT used for the 2631 line printer driver.

```
   0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15   MNEMONIC
 +-+-+-+-+-+-+-+-+-+-+--+--+--+--+--+--+
0| 0| 0|AC|RQ| 0| 0| 0|IO|IR|NO|ST| 0|   STATE   |  DFLAG
 +-+-+-+-+-+-+-+-+-+-+--+--+--+--+--+--+
1| SYSDB relative pointer to the DIT for the next|  DLINK
 | devices requesting this resource or service   |
 +-----------------------------------------------+
2| IDQ table relative index to the first IDQ in  |  DIDQP
 | request list for this device                  |
 +-----------------------------------------------+
3|          Logical device number                |  DLDEV
 +-----------------------------------------------+
4| SYSDB relative pointer to Device Linkage Table|  DDLTP
 +-----------------------------------------------+
5| SYSDB relative pntr to Interrupt Linkage Table|  DILTP
 +-----------------------------------------------+
6|                              |BJ|RB|PS|FL|TP|  DSRVE
 +-----------------------------------------------+
7| Hardware error status.  Set when the driver   |  DSERR
 | detects an error.  Whenever <>0, the driver   |
 | monitor logs an I/O error and clears this word|
 +-----------------------------------------------+
X10| Bit 0 is set at completion of timer          |  DTIME
   +----------------------------------------------+
X11| Holds the time out request entry index while |  DRQST
   | a timer is active.                           |
   +----------------------------------------------+
X12| IOT |//////////////////|     Physical unit #  |  DUNIT
   +----------------------------------------------+
X13|          Hardware logged error status        | DLOGERROR
   +----------------------------------------------+
```

DFLAG - Flags and request state
- AC ACTIVE - A monitor is currently servicing this device.
- RQ REQUEST - A service request is pending while the monitor is active.
- IO IOPROG - An I/O Channel Program is running for this device.
- IA IAK - An interrupt or response has occurred for this device.
- NO NOTROY - Go to state X10 after Idle Channel Program is started.
- ST STWAIT - The device monitor is starting an Idle Channel Program for this device. There is no IDQ associated with this type of request.





```
STATE       - State of the device monitor.  Specifies the next action
              to be taken in SIODM in servicing the request:
                0 - start new request
                1 - not used
                2 - call driver initiator procedure
                3 - call driver completor procedure
                4 - not used
                5 - process request completed
                6 - initiate device recognition sequence
                7 - start operator intervention wait
               X10 - wait for interrupt (operator intervention)
                     restart at state 0
               X11 - wait for data segment freeze, then state 2
               X12 - wait for driver initiator to be frozen, then
                     allocate controller (state 2)
               X13 - wait for I/O completion interrupt, then state 3
               X14 - wait for controller, then call driver initiator
               X15 - not used
               X16 - wait for initiator make present, then state 2
               X17 - wait for completor make present, then state 3

DLDEV - I/O system type, unit and logical device number
  IOT I/O TYPE - Type of I/O system
                 0 - HP3000 Series 2/3
                 1 - HP3000 HP-IB Systems
                 2 - Unused
                 3 - Unused

DSRVE - Device processing flags
  BJ   BETJOB    - Between jobs flag. If set, suppress
                   Powerfail message.
  RB   RBORT     - Abort (caused by Powerfail or Operator)
                   has occurred.
  PS   PRESPACE  - Last request used prespacing.
  FL   FULL      - Line printer buffer is full.
  TP   TOP       - Printer is at top of form
```





HP 2680A/2688A DIT

```
        0 1 2 3 4 5 6 7 8 9  10 11 12 13 14 15
      +-+-+-+-+-+-+-+-+-+-+--+--+--+--+--+--+
DIT0  !0 !0 !AC!RQ!0 !0 !SP!CP!IA!NR!SW!  !   STATE   !  DFLAG
      +-+-+-+-+-+-+-+-+-+-+--+--+--+--+--+--+
   1  !          POINTER TO NEXT DIT                  !  DLINK
      +-----------------------------------------------+
   2  !          INDEX TO ACTIVE IDQ OR ZERO          !  DIDQP
      +-----------------------------------------------+
   3  !          LOGICAL DEVICE NUMBER                !  DLDEV
      +-----------------------------------------------+
   4  !      DRIVER LINKAGE TABLE POINTER             !  DDLTP
      +-----------------------------------------------+
   5  !      INTERRUPT LINKAGE TABLE POINTER          !  DILTP
      +-----------------------------------------------+
   6  !    SPECIAL ERROR CONDITIONS TO BE LOGGED      !  DSTRT
      +-----------------------------------------------+
   7  !          ERROR LOGGING INFORMATION            !  DSERR
      +-----------------------------------------------+
   8  !T !    TIMEOUT INDICATION IN BIT 0             !  DTIME
      +-----------------------------------------------+
   9  !       TIMER REQUEST INDEX (TRL) OR ZERO       !  DTRLX
      +-----------------------------------------------+
  10  ! IOT !//////////////////!    PHYSICAL UNIT N    !  DUNIT
      !-----------------------------------------------!
  11  !          CURRENT DATA WRITE BYTE COUNT        !  DCBCNT
      +-----------------------------------------------+
  12  !           CURRENT DATA WORD COUNT             !  DCWCNT
      +-----------------------------------------------+
  13  !        # OF WORDS LEFT TO TRANSFER            !  DRCNT
      +-----------------------------------------------+
  14  !  BUFFER OFFSET FOR NEXT # OF WORDS TO XFER.   !  DOFFSET
      +-----------------------------------------------+
  15  !                                          !0!  !  DDEBUG
      +-----------------------------------------------+
  16  ! I/O STATUS BLOCK WORD 1 GETS LOGGED FROM HERE !  DLOGBUFFER
      +-----------------------------------------------+
  17  ! I/O STATUS BLOCK WORD 3 GETS LOGGED FROM HERE !
      +-----------------------------------------------+
18/33 ! I/O STATUS AREA (16 WORDS, SEE DEFINITION)    !  DIOSTAT
      +-----------------------------------------------+
```

DFLAG - DEVICE RELATIVE FLAGS.
- AC ACTIVE BIT. 1 IMPLIES A MONITOR CURRENTLY SERVICING THIS DEVICE.
- RQ REQUEST BIT. 1 IMPLIES SERVICE REQUESTED WHILE MONITOR IS ACTIVE.
- SP SIO PREEMPTION. IF SET THEN A PREEMPTIVE REQUEST HAS BEEN QUEUED FOR THIS DEVICE. PREEMPT CODE IS SET IN IDQ ELEMENT.
- CP CHANNEL PROGRAM IN PROGRESS. IF SET, THEN A CHANNEL PROGRAM IS CURRENTLY EXECUTING.
- IA IF SET, AN INTERRUPT OR RESPONSE HAS OCCURRED.

NR — IF SET, OEVICE IS IN R NOT READY OR OPERRTOR WRIT.
SW — IF SET, AN IDLE CHANNEL PROGRRM SHOULO BE STARTEO FOR THIS OEVICE.
MSTRTE — CURRENT ORIVER STRTE AS OEFINEO BY THE MONITOR. RLLOWRBLE STATES ARE:
0 - STRRT REQUEST
1 - NOT USED(BUT RESERVED)
2 - CRLL DRIVER INITIATOR
3 - CRLL DRIVER COMPLETOR
4 - UNUSED(BUT RESERVED)
5 - COMPLETE REQUEST..PERNRPS RETURN TO USER.
6 - UNEXPECTEO INTERRUPT OCCURRED.
7 - START OPERATOR INTERVENTION WRIT.
X10 - WRITING (ON OPERATOR). RESTRRT RT 0.
11 - WRITING (DATA MAKEPRESENT/FREEZING)
12 - WRITING (INITIATOR CODE MAKEPRESENT/FREEZE)
13 - WRITING (FOR COMPLETION INTERRUPT)
14 - WRITING (FOR OEVICE CONTROLLER RVAILABILITY)
15 - UNUSED(BUT RESERVED)
16 - WRITING (INITIATOR CODE MAKEPRESENT)
17 - WRITING (COMPLETOR CODE MAKEPRESENT)

DLOEV - I/O SYSTEM TYPE, UNIT RND LOGICRL OEVICE NUMBER.
IDT — I/O SYSTEM TYPE.
0 - HP3000 SERIES II/III (SID/DIO)
1 - HP-IB Systems
2 - RESERVED
3 - RESERVED

DCBCNT - CURRENT BYTE COUNT TO BE TRANSFERRED.

OCWCNT - CURRENT WORD COUNT TO BE TRANSFERRED.

ORCNT - REMAINING WORO COUNT TO TRANSFER.

DOFFSET - OFFSET IN BUFFER OF NEXT N WORDS TO TRANSFER.

DDEBUG - IF BIT 15=1 THEN DEBUGGING INFO WILL BE SENT TO CONSOLE

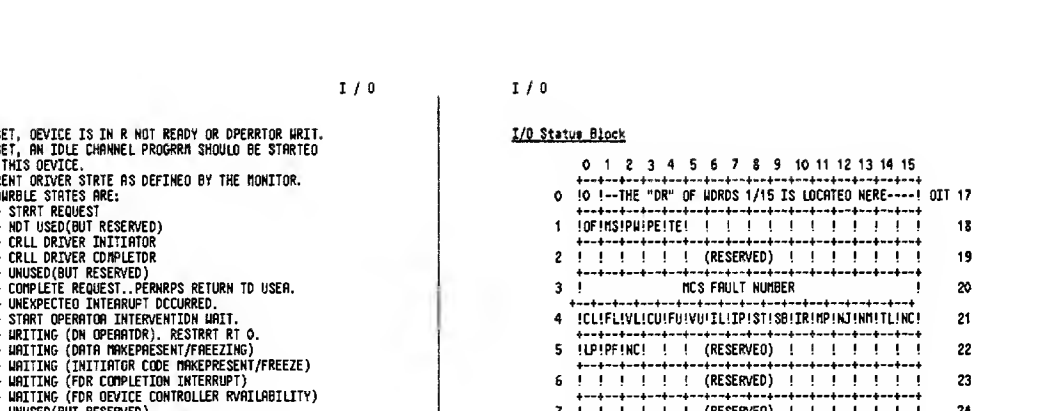
OLOGBUFFER - STATUS WORDS 1 & 3 RRE MOVED HERE TO BE LOGGED IF THEY WERE LOGGED FROM THE I/O STATUS BLOCK THEIR CONTENTS MIGHT BE CHRNGED BEFORE THEY WERE LOGGED.

OIOSTAT - I/O STATUS RRER 16 WORDS, SEE I/O STRTUS BLOCK OEFINITION.





I/O Status Block




WOAO 0 - ERCN BIT IS THE 'OR' OF ONE WORD IN THE TABLE (EXCEPT BIT 0 WHICH IS NOT USED). THEREFORE, BIT .(1:1) IS SET IF WORD 1 IN THE TABLE IS NON-ZERO.

WOAO 1 - BIT= 0 - (OF) ONLINE/OFFLINE BIT.
1 - (MS) MESSAGE BEING OISPLAYED ON THE 2680A/2688A CONSOLE.
2 - (PW) POWER UP COMPLETED SINCE LAST I/O STATUS READ.
3 - (PE) PARITY ERROR OETECTED ON PNI COMMAND.
4 - (TE) TRRNSMISSION ERROR DETECTED IN THE PRINTER.
5/15 - RESERVED. UNUSED.

WORD 2 - NOT USED. RESERVED.

WORD 3 - MCS FAULT NUMBER. CONTAINS AN INTEGER DESCRIBING THE LAST FAULT TO OCCUR SINCE THE LAST TIME THE I/O STRTUS WAS READ OR THE HP 2680A/2688A WAS POWERED DOWN. IF THE WORD IS ZERO THERE





IS NO MCS FAULT. SEE OCS ERS FOR A DESCAIPTION OF THE MCS FRULT NUMBERS.

WORD 4 - BIT= 0 - (CL) NO ROOM FOR RTTEMPTED CHARRCTER SET LORO.
1 - (FL) NO ROOM FOR ATTEMPTED FORM LORO.
2 - (VL) NO ROOM FOR ATTEMPTED VFC LORO.
3 - (CU) ATTEMPT TO PRINT OATA AND THERE IS NO CURRENTLY SELECTED CHARRCTER SET.
4 - (FU) RTTEMPT TO SELECT RN UNDEFINED FORM SET.
5 - (VU) ATTEMPT TO PRINT ORTR RND THERE IS NO CURRENTLY SELECTED VFC SET.
6 - (IL) RTTEMPT TO PRINT ORTR RND THERE IS NO CURRENTLY SELECTED LOGICRL PRGE TRBLE (LPT) ENTRY.
7 - (IP) ATTEMPT TO MOVE PEN OFF THE LOGICAL PRGE.
8 - (ST) THE 2680A/2688R COULO NOT PROCESS RLL OF THE OATR BEFORE IT WAS SUPPOSEO TO BE TRANSFERREO TO THE ORUM/PAPER. OATA WAS LOST!
9 - (SB) SPOOLER BLOCK CONTRINS FORMRT ERROR.
10 - (IR) INVRLIO RECOVERY BLOCK RECEIVED FROM SPOOLER.
11 - (MP) MRXIMUM NUMBER OF COPIES PER PHYSICRL PAGE HRS BEEN EXCEEDED. THIS IS A RESULT OF THE SPOOLER PROCESS SETTING THE MRXIMUM COPIES PER PAGE WITH FUNCTION CODE 132.
12 - (NJ) R COMMRND OR FUNCTION CODE WRS RECEIVED WHEN NO "JOB" WAS IN PROGRESS. THE COMMAND OR FUNCTION WAS IGNORED BY THE OCS.
13 - (NM) NO MEMORY. 2680A/2688R OYNRMIC MEMORY RLLOCRTION HRS OETECTEO THAT MRIN MEMORY IS COMPLETELY OCCUPIED WITH CHRRRCTER SETS, VFC'S, FORMS RNO OATA SUCH THAT THE 2680A/2688A CRNNOT PROCESS THE CURRENT INPUT OATA. DATA WILL BE LOST!
14 - (TL) RTTEMPT TO PRINT DATA RND THERE RRE MORE THRN THE MRXIMUM RLLOWRBLE LOGICAL PAGE TABLE (LPT) ENTRIES SELECTED.
15 - (NC) R NON-EXISTENT VFC CHANNEL WAS SKIPPED TO.

WORO 5 - BIT= 0 - (LP) LOGICAL PAGE TRUNCATED TO FIT PHYSICAL PAGE.
1 - (PF) PAGE SIZE REQUIRED BY PROGRRMMER OIO NOT MATCH PAGE SIZE SET BY OPERRTOR. OPERRTOR PAGE SIZE PREVRILS.
2 - (NC) NO CHRRRCTER SET SELECTED.

WOROS 6/11 — NOT USED BUT RESERVED FOR FUTURE USE.

WOROS 12/13 - THE RECORO NUMBER WHICH CONTRINS THE OFFENDING ERROR RS OEFINED BY WORO FOUR. IF R POWER FRIL OCCURS OURING R "JOB", THE POWER FRIL BIT IS SET RND R SHEET NUMBER IS MRDE RVRILRBLE IN WOROS FOURTEEN RND FIFTEEN. HOWEVER, THE RECORO NUMBER IS LOST RND CRNNOT BE REPORTED. THESE WORDS OCCUR IN R "JOB" ONLY.

WOROS 14/15 - THE SHEET NUMBER ON WHICH THE ERROR OCCURRED RS OEFINED BY WORO FOUR. IF RN ERROR OCCURS IN THE ENVIRONMENT FILE RT THE START OF R "JOB", THEN THIS NUMBER WILL BE ZERO.

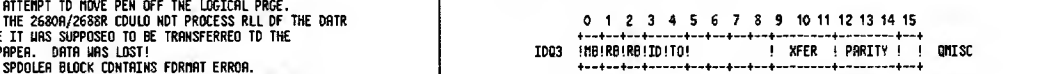




IN RDDITION, WHEN R POWER FRIL OCCURS OURING R "JOB", THE POWER ON BIT IS SET IN WORO ONE RND THE SHEET NUMBER OF THE LRST SUCCESSFULLY TRRNSFERRED PAGE IS PLRCED HERE. THIS INFORMRTION IS FOR USE BY THE SPOOLER SHOULO R RECOVERY OF R "JOB" BE OETERMINED. THESE WORDS OCCUR IN "JOB" ONLY.

ALL WOROS OF THE I/O STATUS RRE CLEARED WHENEVER THE STATUS BLOCK IS RETURNED TO THE HOST. IT IS UP TO THE HOST CPU TO RETRIN RNY ONGOING STATUS BITS REQUIRED.

QMISC -




WHERE:

.(0:1) - MB — USER REQUESTED TRRNSFER IN EXCESS OF 4096 WORDS. THE ORIVER CRN WRITE UP TO 4096 WORDS TO THE 2680A/2688A. IN ORDER TO HRNOLE UP TO 32K WORDS, MULTIPLE WRITES RRE USED WITHOUT R RETURN TO THE USER RND CRLLED THE ORIVER. THIS BIT INDICRTES THRT MULTIPLE WRITES RRE BEING DONE TO THE 2680A/2688R.

.(1:1) - RB — THE CURRENT WRITE BLOCK MUST BE RETRIED.

.(2:1) - RB — USER REQUESTED RBORT IN PROGRESS FLRG.

.(3:1) - IO — I/O STATUS HRS BEEN REAO RNO IS RVRILRBLE.

.(4:1) - TO — GENERRL I/O CONTROLLER TIMED OUT.

.(5:4) - RESERVED — NOT CURRENTLY USED.

.(9:3) - XFER — 2680A/2688A TRRNSFER ERROR COUNTER.

.(12:3)- PRRITY — CHRNNEL PROGRRM COMMRNO PRRITY ERROR COUNTER.

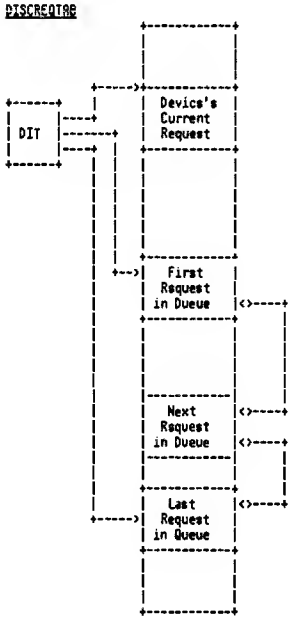
.(15:1)- RESERVED — NOT CURRENTLY USED.

**NOTE** IN THE RBOVE, SINGLE BIT FIELDS RRE RS DEFINED WHEN THE BIT IS R LOGIC "1".

## Disc Request Table and Disc Requests

Requests for disc transfers are effected by acquiring an entry from the Disc Request Table (DISCREQTAB), filling the proper information, and calling the DISCQMANAGER to link the request into the device's doubly linked request qu queue.
The head and tail of a device's request queue are contained in the devices' DIT.

DISCREQTAB








## Disc Request Table

DISCREQTAB DST ENTRY# = 56 (X70)
DISCAEQTAB PRT = X1017

Disc Request Table Entry 0 Format

| | D 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | |
|---|---|---|
| DISCREQTAB00 | TOTAL ENTRIES | |
| DISCREQTAB01 | ENTRY SIZE (X21) | |
| DISCREQTAB02 | PRIMARY ENTRIES | |
| DISCREQTAB03 | IMPEDED PROCESS PCB | |
| DISCREQTAB04 | TABLE INDEX OF HEAD OF AVAILABLE ENTRY LIST | |
| DISCREDTAB05 | TABLE INDEX OF TAIL OF AVAILABLE ENTRY LIST | |
| DISCAEDTAB06 | MAX ENTRIES IN USE | |
| DISCREDTAB07 | CURRENT ENTRIES IN USE | |
| DISCREDTAB08 | OVERFLOWS | |
| DISCAEDTAB09 | TOTAL REQUESTS | |
| DISCAEDTAB10 | | |
| DISCREDTAB11 | SYSBASE INDEX OF HEAD OF DISABLED REQ Q | DISCDHERD |
| DISCAEDTAB12 | SYSBASE INDEX OF TAIL OF DISABLED RED Q | DISCQTAIL |
| DISCREDTAB13 | SERIAL WRITE QUEUE HERD | SEAWDHEAD |
| DISCREQTAB14 | R \|////////////////\| MAX. SERIAL WAITE QUEUE | R = Active |
| DISCREDTAB15 | //////////////////////////////////////////// | |
| DISCREDTAB16 | //////////////////////////////////////////// | |





## Disc Request Element Format

| | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | |
|---|---|---|
| Word 00 | R M D S I B C D M Q S P C D L I<br>B M I B D K D R M U I F U I D N<br>D R R U W O M T E E D R R S R L<br>R E G F R \| P R R U F I R \| L \| B \| D<br>T Q \| \| K \| \| F R E R L E \| \| C<br>\| \| \| \| E \| \| \| \| \| I \| Q \| \| \| R<br>\| \| \| \| \| \| \| \| \| L \| \| \| \| L | |
| Word 01 | REQUEST URGENCY CLASS | URGCLASS |
| Word 02 | LOGICAL DEVICE NUMBER | LDEVN |
| Word 03 | MISCELLANEOUS | MISC |
| Word 04 | S\| DST (IF PROCESS OISC I/D)<br>BANK (IF SEGMENT TRANSFER) | OSTN<br>S=STACK |
| Word 05 | OFFSET INTO DATA SEG (IF PROCESS DISC I/D)<br>ADDRESS IN BANK (IF SEGMENT TRANSFER) | ADDR |
| Word 06 | UNIT N \| FUNCTION | FUNC |
| Word 07 | COUNT/XLOG/CONTADL RETURNS | NFERCNT |
| Word 08 | P1 (NODA IF SEGMENT TRANSFEA | PAR1 |
| Word 09 | P2 (LODA IF SEGMENT TRANSFEA | PAR2 |
| Word 10 | //////////////////////\| DURLIFIER \| STATUS | STRT |
| Word 11 | FREE\| PCB NUMBER | PCBN |
| Word 12 | INDEN OF PREV REQUEST IN QUEUE | PREVAEQP |
| Word 13 | INDEN OF NENT REQUEST IN QUEUE | NEXTREQP |
| Word 14 | - SEGIDENTIFIER (IF SEG TRANSFER) - | SEGIDENT |
| Word 15 | | |
| Word 16 | DISPLACEMENT OF RERD OR WRITE FROM SEG BASE(MA) | SEGDISP |

Note: Upon return to free list, word (#1) becomes index of next EE free entry.





Word 0 - QFLAG - Request dependent flags

| | | |
|---|---|---|
| Bit 0 | .ABORT | Request has been aborted externally. |
| Bit 1 | .MAPED | Request is for a segment transfer. |
| Bit 2 | .DIAG | Diagnostic request (not used). |
| Bit 3 | .SBUF | System Buffer. Target is a system buffer whose index is relative to the start of the SBUF table. |
| Bit 4 | .IOWAKE | Wake caller on completion of request. |
| Bit 5 | .BLOCKED | Blocked I/O. Caller is waited in ATTACHID until request is completed. |
| Bit 6 | .COMPLETED | Request has been completed and caller woken if he had specified. |
| Bit 7 | .DATAFAIN | Data segment has been made present and is frozen. |
| Bit 8 | .MAMEARORD | MAM error on data segment make present. |
| Bit 9 | .PREDQUEUED | Request is queued into disc's req queue |
| Bit 10 | .SFAIL | Start SID failure in GIP. |
| Bit 11 | .PFAIL | The I/O has been aborted because of a powerfail. |
| Bit 12 | .CURREQ | Request is device's current request. |
| Bit 13 | .DISABLED | Request is disabled. |
| Bit 14 | .LDR | Request in local DRQ. |
| Bit 15 | .INLOCAL | Buffer DST is in process locality. |

Word 2 - DLDEV.DLDEVN - Logical Device Number
Word 3 - DMISC - Device dependent.

Word 4
DDSTN - If SYSBUFR is clear then this is the DST number of the target data segment. If bit 0 is set then buffer address is a DB offset value instead of segment relative offset (implemented for MDWRIT ID and MDBUFF).
Word 5
QRDDR - Offset in data segment or sys buff table to target data buffer.
Word 6
DFUNC.FUNC - Function code and qualifiers as specified by driver.

Word 7
QXFERCNT-On initiation specifies the word count if positive or byte count if negative. At completion of the request this location contains the actual transmission count in the same units as the call. Certain control requests return data through this location.
Word 8
QPAR1 - Parameter one, defined by driver
Word 9
QPAR2 - Parameter two, defined by driver
QMISC - Miscellaneous request dependent storage available to driver.
Word 10
QSTAT.PCBN - PCB Number of process which made this request. Zero if not associated with any process and IOQ is to be returned by the system.
.QURLIFIER - A code which further defies or qualifies the general status. Defined by driver.
.STATUS - General Status. Indicates current and result state of the request according to the following codes.
0 - not started or awaiting completion.
1 - successful completion.
2 - end of file detected.
3 - unusual condition.
4 - irrecoverable error.

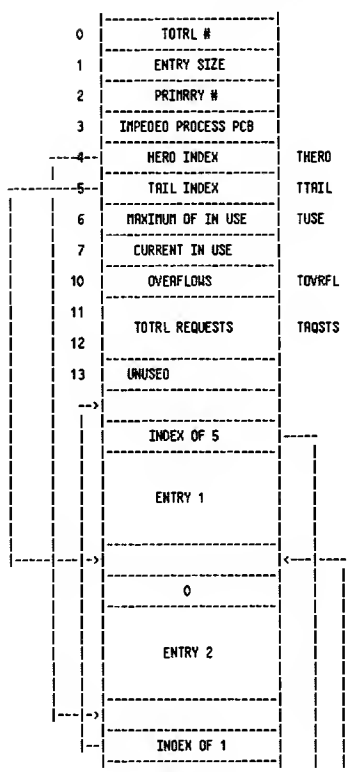
NOTE: See I/O System Status Returns.

Word 11 - bit 0=1 Q element is on free list.





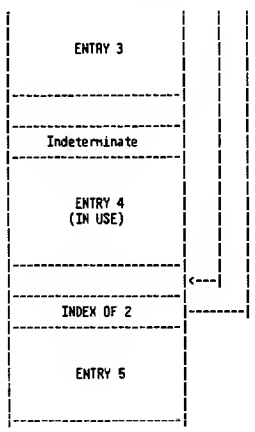
IOQ Table Layout







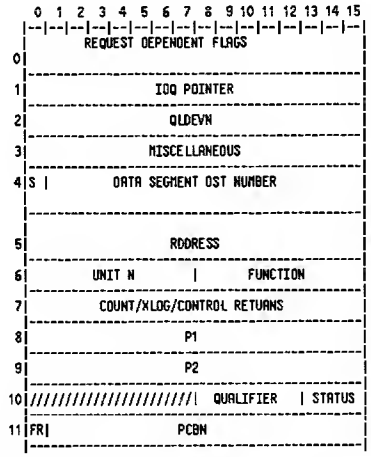

IOQ (Cont.)








I/O Queue Elenent (IOQ)




QFLAG - Request dependent flags

| | | |
|---|---|---|
| Bit 0 | .ABORT | Request has been aborted externally. |
| Bit 1 | .SPECIAL | Special handling is to be applied to this request. For disc, indicates a memory management request. |
| Bit 2 | .DIAG | Diagnostic request (not used). |
| Bit 3 | .SBUF | System Buffer. Target is a system buffer whose index is relative to the start of the SBUF table. |
| Bit 4 | .IOWAKE | Wake caller on completion of request. |
| Bit 5 | .BLOCKED | Blocked I/O. Caller is waited in ATTACHIO until request is completed. |
| Bit 6 | .COMPLETED | Request has been completed and caller woken if he had specified. |

I/O Queue Element (Cont.)

Bit 7 .DATAFRZN Data segment has been made present and is frozen.

Bit 8 .MAMERRORO MAM error on data segment make present.

Bit 9 .PREQ This request has been started but was preempted by a MAM request.

Bit 10 .SFRIL Start SIO Failure in GIP.

Bit 11 .PFRIL The I/O has been aborted because of a powerfail.

Bits12-13 .PREEMPT Preemptive type code: 1-soft, 2-hard.

Bit 15 .MSGDONE R message request reply has completed.
QLINK - Table relative index of next IOQ element. Points to First word of element.
QLDEV - Logical Device Number
QMISC - Device dependant.

QDSTN - If SYSBUFRs is clear then this is the DST number of the target data segment. If bit 0 is set then buffer address is a DB offset value instead of segment relative offset (implemented for NOWAIT IO and NOBUFF).
QADDR - OFfset in data segment or sys buff table to target data buffer.
QFUNC.FUNC - Function code and qualifiers as specified by driver.
QWBCT - On initiation specifies the word count if positive or byte count if negative. At completion of the request this location contains the actual transmission count in the same units as the call. Certain control requests return data through this location.
QPRR1 - Parameter one, defined by driver
QPRR2 - Parameter two, defined by driver
QMISC - Miscellaneous request dependent storage available to driver.
QPCBN - PCB Number of process which made this request. Zero if not associated with any process and IOQ is to be returned by the system.
.QUALIFIER - R code which further defies or qualifies the general status. Defined by driver.
.STRTUS - General Status. Indicates current and result state of the request according to the following codes.
0 - not started or awaiting completion.
1 - successful completion.
2 - end of File detected.
3 - unusual condition.
4 - irrecoverable error.

Word 11 bit 0- Queue element is on free list.





I/O System Status Returns

| | STRTUS % |
|---|---|
| 0 - PENDING | |
| 1 - WAITING FOR COMPLETION | 10 |
| 2 - DOING ERROR RECOVERY | 20 |
| 3 - NOT READY WAIT | 30 |
| 4 - NO WRITE RING WAIT | 40 |
| 5 - NEW PAPER TAPE WAIT | 50 |
| 1 - SUCCESSFUL | |
| 0 - NORMAL | 1 |
| 1 - READ TERMINATED WITH SPECIAL CHARACTER | 11 |
| 2 - TAPE RETRY FOR SUCCESS REQUIRED | 21 |
| 3 - LOW TAPE OR END OF TAPE AFTER WRITE | 31 |
| 2 - END OF FILE | |
| 1 - PHYSICAL END OF FILE | 12 |
| 2 - DATA | 22 |
| 3 - END OF DATA | 32 |
| 4 - HELLO | 42 |
| 5 - BYE | 52 |
| 6 - JOB | 62 |
| 7 - END OF JOB | 72 |
| 3 - UNUSUAL CONDITION | |
| 1 - TERMINAL PARITY ERROR | 13 |
| 2 - TERMINAL READ TIMED OUT | 23 |
| 3 - I/O ABORTED EXTERNALLY | 33 |
| 4 - DATA LOST | 43 |
| 5 - DATA SET NOT READY OR DISCONNECT OR UNIT NOT ON LINE | 53 |
| 6 - ABORTED BECAUSE OF POWER FAIL | 63 |
| 7 - BOT AND BSR, BSF REQUEST | 73 |
| 10 - TAPE RUNAWAY | 103 |
| 11 - EOT AND WRITE REQUEST | 113 |
| 12 - NO WRITE RING AFTER REQUEST TO QPERRTOR | 123 |
| 13 - END OF TAPE (PAPER TAPE LOW) | 133 |
| 14 - PLOTTER LIMIT SWITCH REACHED | 143 |
| 15 - ENABLE SUBSYSTEM BREAK AND NO CONTROL Y PIN | 153 |
| 16 - READ TIME RETURNED OVERFLOW | 163 |
| 17 - BREAK STOPPED READ | 173 |
| 20 - WRITE AND NO CARD IN WAIT STATION | 203 |
| 21 - DEVICE POWERED ON - OPERATING ENVIRONMENT LOST | 213 |
| 27 - VFC HAS BEEN RESET | 273 |





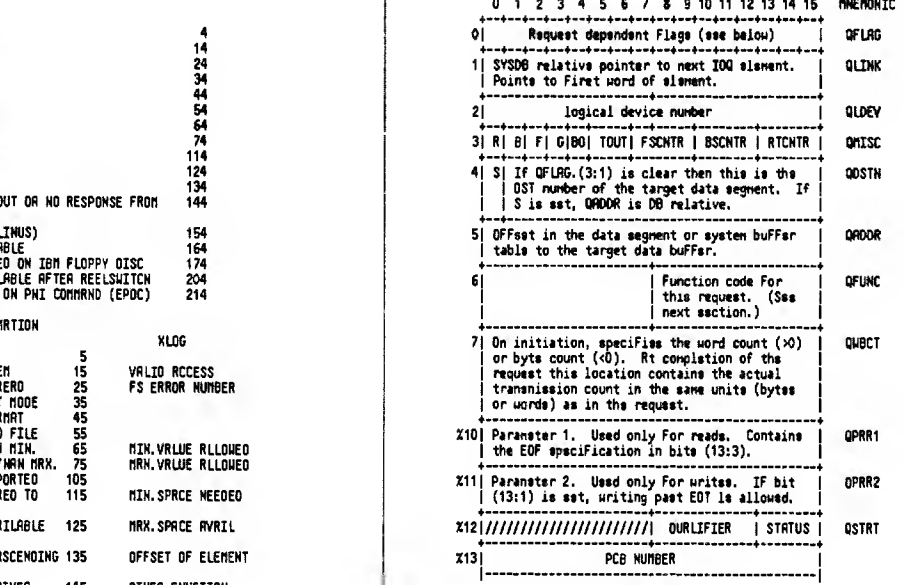
I/O System Status Returns (Cont.)

| | | XLOG | |
|---|---|---|---|
| 4 - IRRECOVERABLE ERROR | | | |
| 0 - INVALID REQUEST | 4 | | |
| 1 - TRANSMISSION ERROR | 14 | | |
| 2 - I/O TIME OUT | 24 | | |
| 3 - TIMING ERROR | 34 | | |
| 4 - SIO FAILURE | 44 | | |
| 5 - UNIT FAILURE | 54 | | |
| 6 - INVALID DISC ADDRESS | 64 | | |
| 7 - TAPE PARITY ERROR | 74 | | |
| 11 - PAPER TAPE TAPE ERROR | 114 | | |
| 12 - SYSTEM ERROR | 124 | | |
| 13 - INVALID SBUF INDEX | 134 | | |
| 14 - CHANNEL FAILURE, TIMEOUT OR NO RESPONSE FROM CONTROLLER | 144 | | |
| 15 - UNINITIALIZED MEDIA (LINUS) | 154 | | |
| 16 - NO SPARE BLOCKS AVAILABLE | 164 | | |
| 17 - DELETED RECORD DETECTED ON IBM FLOPPY DISC | 174 | | |
| 20 - LABELED DEVICE UNAVAILABLE AFTER REELSWITCH | 204 | | |
| 21 - PARITY ERROR DETECTED ON PHI COMMAND (EPOC) | 214 | | |
| 5 - ERROR IN QRTR CONTROL INFORMATION | | | |
| 0 - INVALID ITEM NUMBER | 5 | | |
| 1 - INVALID ACCESS FOR ITEM | 15 | VALID ACCESS | |
| 2 - FAILURE IN FOPEN OR FREAD | 25 | FS ERROR NUMBER | |
| 3 - PARITY CHANGE IN 8 BIT MODE | 35 | | |
| 4 - INVALID INFO. FILE FORMAT | 45 | | |
| 5 - CHECKSUM ERROR IN INFO FILE | 55 | | |
| 6 - PASSED VALUE LESS THAN MIN. | 65 | MIN.VALUE ALLOWED | |
| 7 - PASSED VALUE GREATER THAN MAX. | 75 | MAX.VALUE ALLOWED | |
| 10 - PASSED VALUE IS UNSUPPORTED | 105 | | |
| 11 - COUNT LESS THAN REQUIRED TO RETURN ALL INFO. | 115 | MIN.SPACE NEEDED | |
| 12 - COUNT GREATER THAN AVAILABLE TO STORE INFO. | 125 | MAX.SPACE AVAIL | |
| 13 - PASSED VALUES NOT IN ASCENDING ORDER | 135 | OFFSET OF ELEMENT | |
| 14 - PASSED CHARACTER HAS OTHER DEFINED FUNCTION | 145 | OTHER FUNCTION | |





I/O Queue Element for 7976A Magnetic Tape




QFLAG - Request dependent flags

Bit 0 ABORT - Abort this request and return an error indication to the caller.

Bit 1 SPECIAL - Apply special handling to this request. (Not used)
Bit 2 DIAG - This is a request From the diagnostic subsystem. (Not used)
Bit 3 SYSBUFF - Target is an index relative to the SBUF Table of the data buffer.
Bit 4 IOWAKE - Wake caller on completion of request.
Bit 5 BLOCKED - Blocked I/O. The caller is waited in ATTACHIO

until the request is completed. Implies IOWAKE.
Bit 6 COMPLETED - The request has been completed and the caller awakened if he had requested (with IOWAKE).
Bit 7 DATAFRZN - Set by the memory management routines (MAM) when a MAKEPRESENT request is successfully completed and indicates the data segment is frozen in memory.
Bit 8 MAMERRORQ - An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.
Bit 9 PREQ - (Not used)
Bit 10 SFAIL - Delayed failure of SIO instruction. If a call to START'NPIB resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11 PFAIL - The request was aborted because of a system power failure.

QMISC - Driver request dependent flags and counters. Used mostly for error retries.

RETRY - Indicates an error retry is in progress.
BACK - Backspace record processing for an error retry is in progress.
FORWARD - Forward space record processing for an error retry is in progress.
GAP - Gap processing for an error retry is in progress.
BDOEOF - Backspace record due to a data EOF processing is in progress.
TOUTCNTR - GIC timed-out counter.
FSCNTR - Forward space record counter.
BSCNTR - Backspace record counter.
ATCNTR - Error retry counter.

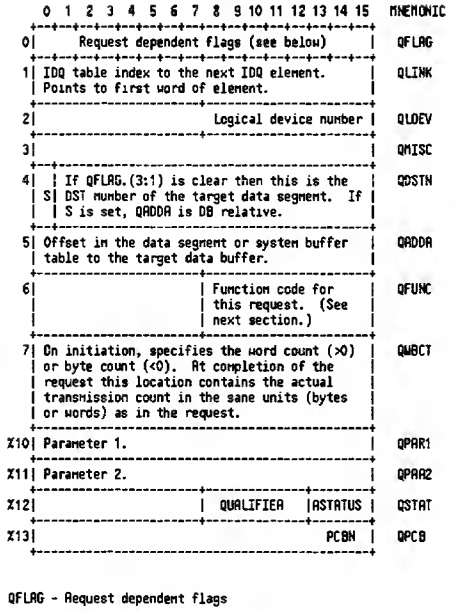
QSTAT - PCB number and request completion status.

PCBN - The Process Control Block (PCB) number of the process which made this request. If zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.
STATUS - General status indicating the final state of the request. The following codes are used:
0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.
QUALIFIER - A code which further defines or qualifies the general status. (See the section Driver Return Status Codes.)





I/O Queue Element (IOQ) for CIPER

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Bit 3 SYSBUFF - Target is an index relative to the SBUF Table of the data buffer.
Bit 4 IOWAKE - Wake caller on completion of request.
Bit 5 BLOCKED - Blocked I/O. The caller is waited in ATTACHIO until the request is completed. Implies IOWAKE.
Bit 6 COMPLETED - The request has been completed and the caller awakened if he had requested (with IOWAKE).
Bit 7 DATAFRZN - Set by the memory management routines (MAM) when a





MAKEPRESENT request is successfully completed and indicates the data segment is frozen in memory.
Bit 8 MAMERROR - An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.
Bit 9 PREQ - (Not used)
Bit 10 SFAIL - Delayed failure of SIO instruction. If a call to STARTID resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11 PFAIL - The request was aborted because of a system power failure.

QSTAT - PCB number and request completion status.

PCBN - The Process Control Block (PCB) number of the process which made this request. If zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.
RSTATUS - General status indicating the final state of the request. The following codes are used:

0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.

QUALIFIER - A code which further defines or qualifies the general status. (See the section Driver Return Status Codes.)

NP-IB CIPER Physical Driver Request Codes

| OPERATION | FUNCTION | PARAMETERS |
|---|---|---|
| READ | 0 | None |
| WRITE | 1 | None |
| FILE OPEN | 2 | None |
| FILE CLOSE | 3 | None |
| DEVICE CLOSE | 4 | None |
| CIPER INIT | 184 | None |

CIPER Driver Return Status Codes

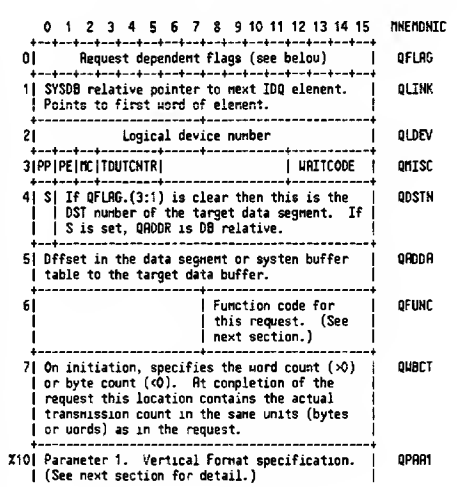
| General Status (13:3) | Qualifying Status (8:5) | Overall (8:8) |
|---|---|---|

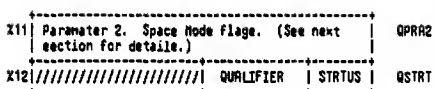




| | | |
|---|---|---|
| 0 - Pending | 1 - Waiting For Completion | %10 |
| | 3 - Not Ready Wait | %30 |
| 1 - Successful | 0 - No Errors | %1 |
| 2 - End of File | (Not Used) | |
| 3 - Unusual Condition | 3 - Request Aborted | %33 |
| | 6 - Powerfail Abort | %63 |
| | %21 - Device Powered Up | %213 |
| 4 - Irrecoverable Error | 0 - Invalid Request | %4 |
| | 1 - Transfer Error | %14 |
| | 2 - I/O Timed Out Before Complete | %24 |
| | 4 - SIO Failure | %44 |
| | 5 - Unit Failure | %54 |
| | %12 - System Error | %124 |
| | %14 - Channel Failure | %144 |
| | %21 - Parity Error | %214 |

2608 Line Printer I/O Queue Element (HP-IB Systems)






QFLAG - Request dependent flags

Bit 0 ABORT - Abort this request and return an error indication to the caller.
Bit 1 SPECIRL - Apply special handling to this request. (Not used)
Bit 2 DIAG - This is a request from the diagnostic subsystem. (Not used)
Bit 3 SYSBUFF - Target is an index relative to the SBUF Table of the data buffer.
Bit 4 IOWAKE - Wake caller on completion of request.
Bit 5 BLOCKED - Blocked I/O. The caller is waited in RTTRCNIO until the request is completed. Implies IOWAKE.
Bit 6 COMPLETED - The request has been completed and the caller awakened if he had requested (with IOWAKE).





Bit 7 DATAFRZN - Set by the memory management routines (MAM) when a MAKEPRESENT request is successfully completed and indicates the data segment is frozen in memory.
Bit 8 MAMERRORD - An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.
Bit 9 PREQ - (Not used)
Bit 10 SFAIL - Delayed failure of SIO instruction. If a call to STRATIO resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11 PFAIL - The request was aborted because of a system power failure.

QMISC - Driver request dependent flags and counters.

PRE'TO'POST - Pre to post spacing change flag.
PEJECT - Last operation was a page eject.
MASTERCLR - Master clear done to clear powerfail bit in status. Master clear needs to be done from not ready condition.
TOUTCNTR - Channel time-out retry counter.
WAITCODE - Indicates type of wait:
0 - new request
1 - completion wait
2 - not ready wait

QSTAT - PCB number and request completion status.

PCBN - The Process Control Block (PCB) number of the process which made this request. If zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.
STATUS - General status indicating the final state of the request. The following codes are used:
0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.
QUALIFIER - A code which further defines or qualifies the general status. (See the section Driver Return Status Codes.)





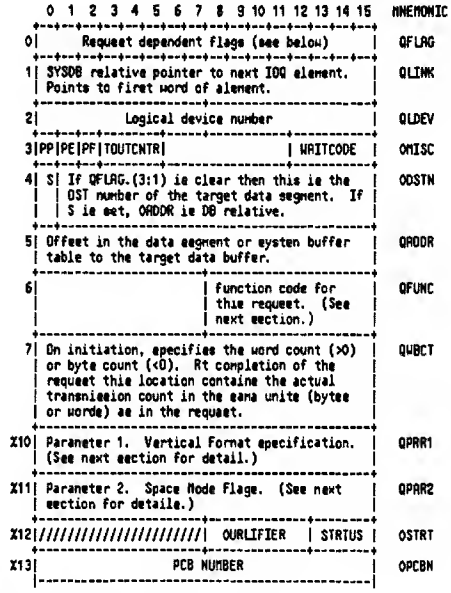
2608 Line Printer Request Codes

| Operation | function | Parameters |
|---|---|---|
| WRITE | 1 | P1 - Vertical Format Specification<br>1 - use 1st data char as format spec<br>X53 - "+", print and suppress spacing<br>X55 - "-", print and triple space<br>X60 - "0", print and double space<br>X61 - "1", print and top of form<br>X200-X277, print and space N-X200 lines<br>X300-X377, print with channel N-X277<br>All others, print and single space.<br>P2 - Space Mode Flags<br>(15:1) - Prespace flag<br>if set, print then fill buffer<br>if clear, fill buffer then print<br>(14:1) - No page stepover flag<br>if set, single and double space without stepover (66 lines/page)<br>if clear, single and double space with stepover (60 lines/page) |
| FILE OPEN | 2 | Page eject if not at top of form |
| FILE CLOSE | 3 | Page eject if not at top of form |
| DEVICE CLOSE | 4 | Page eject if not at top of form |
| READ STATUS | X17 | Read I/O status<br>Count - buffer must be at least 2 bytes |
| VFC SET | X100 | Load VFC RAM<br>Count - form length in words<br>(0 loads RAM form internal ROM)<br>P1 - 6 for 6 LPI or 8 for 8 LPI<br>any other value defaults to 6 LPI |
| TAB SET | X101 | Sets logical column definition<br>P1 - 0 to 15, any other value defaults to 15 |





2619A & 2631 Line Printer IOQ Element (MP-IB Systems)




QFLAG - Request dependent flags

Bit 0 ABORT - Abort this request and return an error indication to the caller.
Bit 1 SPECIRL - Apply special handling to this request. (Not used)
Bit 2 DIAG - This is a request from the diagnostic subsystem. (Not used)
Bit 3 SYSBUFF - Target is an index relative to the SBUF Table of the data buffer.
Bit 4 IOWAKE - Wake caller on completion of request.
Bit 5 BLOCKED - Blocked I/O. The caller is waited in RTTRCHIO

until the request is completed. Implies IOWAKE.
Bit 6 COMPLETEO - The request has been completed and the caller awakened if he had requested (with IOWAKE).

Bit 7 DATRFAZN - Set by the memory management routines (MRM) when a MRKEPRESENT request is successfully completed and indicates the data segment is frozen in memory.
Bit 8 MAMERRORD - An error has occurred while MRM was trying to make the target data segment present and freeze it in memory.
Bit 9 PREQ - (Not used)
Bit 10 SFAIL - Delayed failure of SIO instruction. If a call to STARTIO resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11 PFRIL - The request was aborted because of a system power failure.

QMISC - Driver request dependent flags and counters for 2631.

PRE'TO'POST - Pre to post spacing change flag.
PEJECT - Last operation was a page eject.
TOUTCNTR - Channel time-out retry counter.
POWERFAIL - Power fail flag indicates power fail occurred.
WRITCODE - Indicates type of wait:
0 - new request
1 - completion wait
2 - not ready wait





Format for 2619A

| 0 | 1 | 2 | 3 | 4 | | | | | | | 12 | | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PP | PE | PF | TO | BF | | | | | | | WAITCODE | | |

TOUT - Channel timed out flag
BUF'FILL - Buffer fill operation in progress

QSTRT - PCB number and request completion status.

PCBN - The Process Control Block (PCB) number of the process which made this request. If zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.
STATUS - General status indicating the final state of the request. The following codes are used:
0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.
QUALIFIER - A code which further defines or qualifies the general status. (See the section Driver Return Status Codes.)





2619 Line Printer Request Codes

| Operation | Function | Parameters |
|---|---|---|
| WRITE | 1 | P1 - Vertical Format Specification<br>1 - Use 1st data char as format specification.<br>%53 - "+", print and suppress spacing<br>%55 - "-", print and triple space<br>%60 - "0", print and double space<br>%61 - "1", print and top of form<br>%200-%277, print and space N-%200 lines<br>%300-%312, print with channel N-%277<br>%320 - Fill Line Printer Buffer Only<br>All others, print and single space.<br>P2 - Space Mode Flags<br>(15:1) - Prespace Flag<br>if set, print then Fill buffer<br>if clear, fill buffer then print<br>(14:1) - No page stepover flag<br>if set, single and double space without stepover (66 lines/page)<br>if clear, single and double space with stepover (60 lines/page) |
| FILE OPEN | 2 | Page eject if not at top of form |
| FILE CLOSE | 3 | Page eject if not at top of form |
| DEVICE CLOSE | 4 | Page eject if not at top of form |
| RERD STATUS | %17 | Read I/O status<br>Count - buffer size |
| *IDENTIFY | %110 | Return ID value in Bank & Buffaddr |
| *SELF TEST: | | |
| INITIATE | %111 | Subtest number to execute in Bank and Buffaddr (subtest number ranges fron 0 to 7) |
| STATUS | %112 | Subtest result returned in Bank & Buffaddr |
| *LOOPBACK TEST: | | |
| WRT DRTR | %113 | Data to LP in Bank & Buffaddr [PING] |
| RERD DRTR | %114 | Data from LP read into Bank & Buffaddr [PONG]<br>Count - Buffer Size (256 bytes max) |

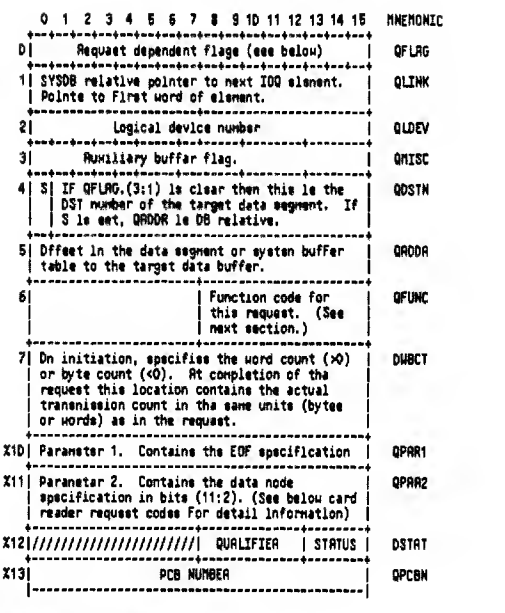




2631 Line Printer Request Codes (HP-IB)

| Operation | Function | Parameters |
|---|---|---|
| WRITE | 1 | P1 - Vertical format Specification<br>1 - Use 1st data char as format specification.<br>%53 - "+", print and suppress spacing<br>%55 - "-", print and triple space<br>%60 - "0", print and double space<br>%61 - "1", print and top of form<br>%200-%277, print and space N-%200 lines<br>%300-%307, print with channel N-%277<br>%320 - Fill Line Printer Buffer Only<br>All others, print and single space.<br>P2 - Space Mode flags<br>(15:1) - Prespace flag<br>if set, print then fill buffer<br>if clear, fill buffer then print<br>(14:1) - No page stepover flag<br>if set, single and double space without stepover (66 lines/page)<br>if clear, single and double space with stepover (60 lines/page) |
| FILE OPEN | 2 | Page eject if not at top of form |
| FILE CLOSE | 3 | Page eject if not at top of form |
| DEVICE CLOSE | 4 | Page eject if not at top of form |
| RERD STATUS | %17 | Read I/O status<br>Count - 1 byte minimum required |
| VFC SET | %100 | LORDS VFC RRM<br>P1 - 1 - 1 LPI (lines per inch)<br>2 - 2 LPI<br>3 - 3 LPI<br>4 - 4 LPI<br>5 - 5 LPI<br>6 - 6 LPI<br>8 - 8 LPI<br>12 - 12 LPI<br>Rny other value defaults to 6 LPI. |

## I/O Queue Element For HP-IB Card Reader




QFLAG - Request dependent flags

Bit 0 ABORT - Abort this request and return an error indication to the caller.
Bit 1 SPECIAL - Apply special handling to this request. (Not used)
Bit 2 DIAG - This is a request from the diagnostic subsystem.
Bit 3 SYSBUFF - Target is an index relative to the SBUF Table of the data buffer.
Bit 4 IOWAKE - Wake caller on completion of request.
Bit 5 BLOCKEQ - Blocked I/O. The caller is waited in ATTACHIO until the request is completed. Implies IOWAKE.





Bit 6 COMPLETED - The request has been completed and the caller awakened if he had requested (with IOWAKE).
Bit 7 DATAFAZN - Set by the memory management routines (MAM) when a MAKEPRESENT request is successfully completed and indicates the data segment is frozen in memory.
Bit 8 MAMERRORD - An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.
Bit 9 PREQ - (Not used)
Bit 10 SFAIL - Delayed Failure of SIO instruction. If a call to STARTIO resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11 PFAIL - The request was aborted because of a system power failure.

QMISC - Auxiliary buffer flag used to indicated a read into the driver's buffer and not the user's buffer.

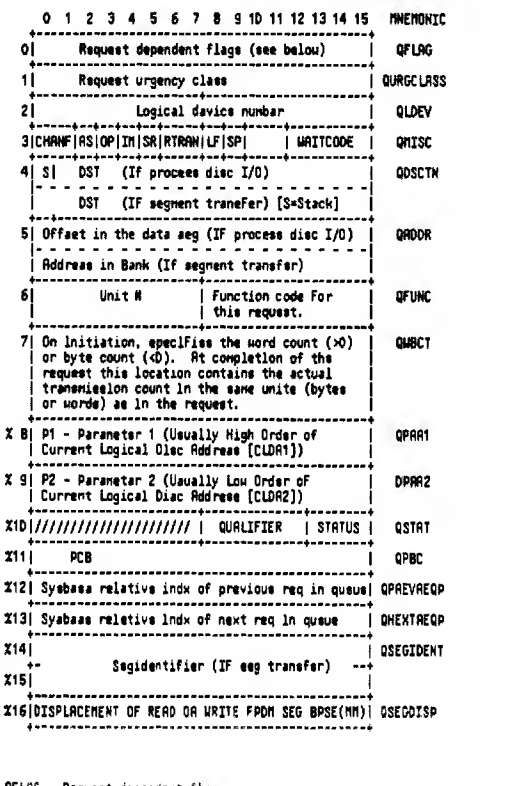
QSTAT - PCB number and request completion status.

PCBN - The Process Control Block (PCB) number of the process which made this request. If zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.
STATUS - General status indicating the final state of the request. The following codes are used:
0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.
QUALIFIER - A code which further defines or qualifies the general status. (See the section Driver Return Status Codes.)





## CS 80 Disc Request Queue Element (IOQ)




QFLAG - Request dependent flags





Bit 0 ABORT - Request has been aborted externally.
Bit 1 MMREQ - Request is for a segment transfer.
Bit 2 DIAG - This is a request from the diagnostic subsystem.
Bit 3 SBUF - Target is an index relative to the SBUF Table of the data buffer.
Bit 4 IOWAKE - Wake caller on completion of request.
Bit 5 BLOCKED - Blocked I/O. The caller is waited in ATTACHIO until the request is completed. Implies IOWAKE.
Bit 6 COMPLETED - The request has been completed and the caller awakened if he had requested (with IOWAKE).
Bit 7 DATAFAZN - Data segment has been present and is frozen.
Bit 8 MAMERRORD - An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.
Bit 9 PREQUEUED - Request is queued into disc's request queue
Bit 10 SFAIL - Delayed Failure of SIO instruction. If a call to STARTIO resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11 PFAIL - The request was aborted because of a system power failure.
Bit 12 CURREQ - Request is device's current request.
Bit 13 DISABLED - Request is disabled.
Bit 14 DISATMPT - Attempt to disable this request.
Bit 15 MSGDONE - A message request reply has completed.

DLDEV.QLDEVN - Logical Device Number

QMISC - Driver request dependent flags and counters.

CHAN'ERR'FLG - Channel error retry Flag.
ASTAT'FAIL'FLG - Request status failed flag.
OPER'REQ'FLG - Operator requested release flag.
IN'FAULT'FLG - Internal maintenance Fault flag.
STAT'ATAY'FLG - Status error single retry flag.
RTRANS'FLG - Retransmit required flag.
LDAD'FLG - Media load Flag.
SYS'PFAIL'FLG - System powerfail Flag.

WAITCODE - Indicates type of wait:

0 - new request
1 - completion wait
2 - not ready wait
3 - release/release deny wait
4 - IOQ defer wait
5 - OSCT read wait
6 - OSCT write wait
7 - synchronization wait

QDSTN - If system buffer is clear then this is the DST number of the target data segment. If bit 0 is set then buffer address is a DB offset value

instead of segment relative offset (implemented for NOWAIT I/O and NOBUFF).

QADDR - Offset in data segment or system buffer table to target data buffer.

QFUNC - Function code and qualifiers as specified by driver.

QSTAT - PCB number and request completion status.

PCBN - The Process Control Block (PCB) number of the process which made this request. If zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.

STATUS - General status indicating the final state of the request.

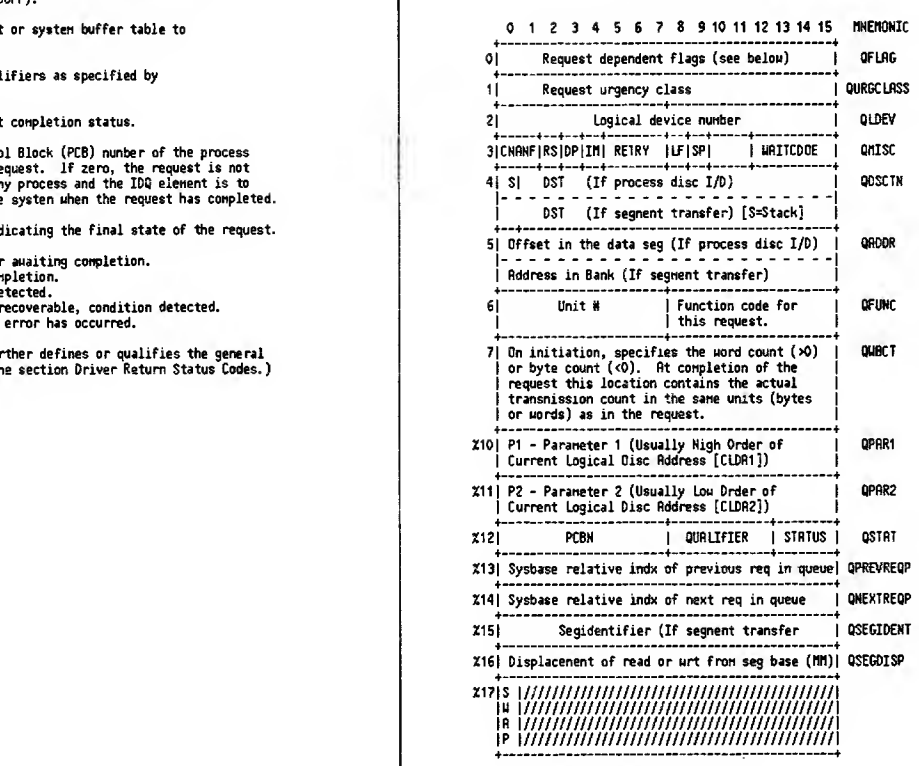
0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.

QUALIFIER - A code which further defines or qualifies the general status. (See the section Driver Return Status Codes.)





CS 80 Integrated Cartridge Tape Request




QFLAG - Request dependent flags





Bit 0 ABORT - Request has been aborted externally.
Bit 1 MMREQ - Request is for a segment transfer.
Bit 2 DIAG - This is a request from the diagnostic subsystem.
Bit 3 SBUF - Target is an index relative to the SBUF Table of the data buffer.
Bit 4 IDWAKE - Wake caller on completion of request.
Bit 5 BLOCKED - Blocked I/O. The caller is waited in ATTACHID until the request is completed. Implies IDWAKE.
Bit 6 COMPLETED - The request has been completed and the caller awakened if he had requested (with IDWAKE).
Bit 7 DATAFRZN - Data segment has been present and is frozen.
Bit 8 MAMERRDRD - An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.
Bit 9 PREQUEUED - Request is queued into disc's request queue
Bit 10 SFAIL - Delayed failure of SIO instruction. If a call to STARTIO resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11 PFAIL - The request was aborted because of a system power failure.
Bit 12 CURREQ - Request is device's current request.
Bit 13 DISABLED - Request is disabled.
Bit 14 DISATMPT - Attempt to disable this request.
Bit 15 MSGDONE - A message request reply has completed.

QLDEV.QLDEVN - Logical Device Number

QMISC - Driver request dependent flags and counters.

CHAN'ERR'FLG - Channel error retry flag.
RSTAT'FAIL'FLG - Request status failed flag.
OPER'REQ'FLG - Operator requested release flag.
IM'FAULT'FLG - Internal maintenance fault flag.
RETRY'COUNT - Retry count area.
LOAD'FLG - Media load flag.
SYS'PFAIL'FLG - System powerfail flag.

WAITCODE - Indicates type of wait:

0 - new request
1 - completion wait
2 - not ready wait
3 - release/release deny wait
4 - IOQ defer wait
5 - DSCT read wait
6 - DSCT write wait
7 - synchronization wait

QOSTN - If system buffer is clear then this is the DST number of the target data segment. If bit 0 is set then buffer address is a DB offset value





instead of segment relative offset (implemented for NOWAIT I/O and NOBUFF).

QADDR - Offset in data segment or system buffer table to target data buffer.

QFUNC - Function code and qualifiers as specified by driver.

QSTAT - PCB number and request completion status.

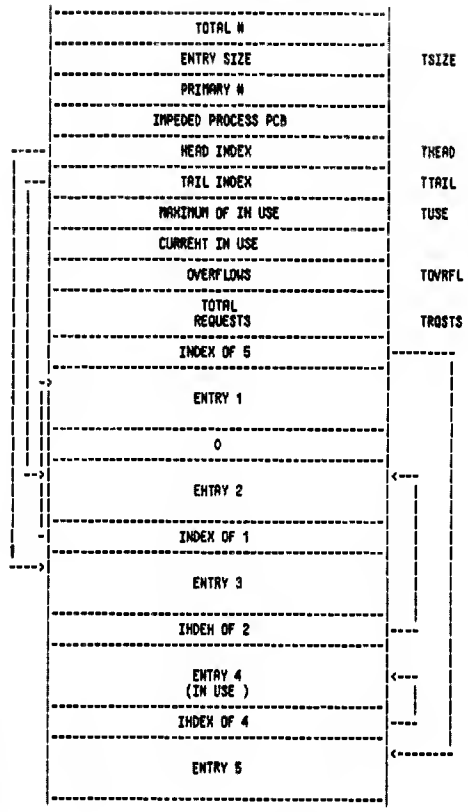
PCBN - The Process Control Block (PCB) number of the process which made this request. If zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.

STATUS - General status indicating the final state of the request.

0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.

QUALIFIER - A code which further defines or qualifies the general status. (See the section Driver Return Status Codes.)

## SBUF Table Layout




3 - 1 - 5 - 4 - 2





## Table Element Allocation (SBUF)

The allocation of the elements in the IOQ terminal buffer (TBUF) and system buffer (SBUF) tables is of concern to the I/O system.

### FREE LIST OF TABLE ELEMENTS

These tables are in the form of a free-linked list of the free elements. For the SBUF's the -1 word of entry is the link to the next element. For the TBUF's, word zero is the link and word 1 is the link for the IOQ elements.

Each word has an 11-word header beginning at the base of the table . The first six words of the header are for managing the table and the second five are for monitoring table activity.

The entries follow the header at word eleven.

### ELEMENT ALLOCATION

Elements are obtained from the beginning of the free list, pointed to by the head and returned to the end of the free list pointed by the tail.

When the free list is empty, the head index is zero and the tail index is set to point at the head index.

The tables are divided into two areas: a primary and a secondary area. Most requests are obtained from the primary area. The secondary area is used only for critical requirements when the primary area is exhausted. These areas are logical areas determined by parameters in the header.

The utility of the core resident tables is seriously reduced if their use is not restricted to dynamic situations.

One of three responses must be specified to the routines which allocate elements from the I/O system tables.

1. Impede caller if primary is empty.
2. Get from primary area only.
3. Get from secondary area if primary area is empty.





## Table Element Allocation (Cont.)

Request types 2 and 3 return an indication to the caller if the request could not be satisfied. The following table specifies the types of calls for element allocation and the action if an element is not activated.

| BUFFER USER | CALL TYPE | FINAL ACTION |
|---|---|---|
| SBUF's | | |
| File system | Impede | --- |
| Ptape | Impede | --- |
| Bad track | Primary | Forget request |
| IOQ's | | |
| ATTACHIO (not impedable) | Primary | Return IOQX-0 |
| ATTACHIO (impedable) | Impede | --- |
| SIOOM (memory management) | Secondary | Sudden death |
| IOMESSAGE | Secondary | I/O error |

HEADER DEFINITION

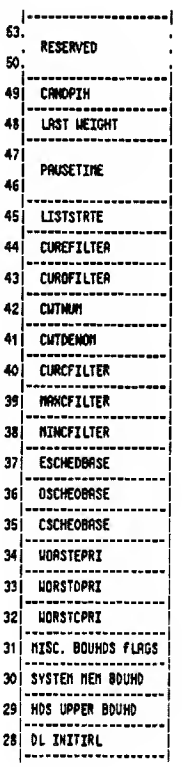
| | |
|---|---|
| Primary # | - Number of elements in the primary area. |
| Total # | - Total number of elements in the table. |
| Size | - Size in words of each element. |
| Impeded PCB | - If not zero then contains the PCB number of the first process waiting for an element in this table. |
| Head index | - Index of first free element. |
| Tail index | - Index of last free element. |
| In use | - Current number not in free list. |
| Overflows | - Number of requests made for an element. |
| Total requests | - Total number of elements requested. |





## ICS Global

QI -



ICS Global (Cont.)

| | | |
|---|---|---|
| 27 | | |
| 26 | XDS SEGMENT BANK | Series 64 only |
| 25 | XDS SEGMENT BASE | Series 64 only |
| 24 | XDS SEGMENT LIMIT | Series 64 only |
| 23 | PRIV BNDS STAT WD | Series 64 only |
| 22 | | |
| | RESERVED | |
| 19 | | |
| 18 | DISAP | PSEN, PSDB counter |
| 17 | Reserved | |
| 16 | SDST | process' stack DSTN |
| 15 | PSTA | pseudo-interrupt status |
| 14 | PADDR | pseudo-interrupt address |
| 13 | TRACE FLAG | flag set non-zero on IXIT away from ICS |
| 12 | PFAIL | PTA to powerfail PCB |
| 11 | JCUT | absolute JCUT address |
| 10 | XP | pointer to executing process PCB |
| 9 | PCBX | absolute stack address |
| 8 | Z | stack DB relative Z |
| 7 | DL | stack DB relative DL |
| 6 | S | stack DB relative S |
| 5 | SBANK | stack bank |





ICS Global (Cont.)

| | | | |
|---|---|---|---|
| | 4 | STDB | absolute stack DB |
| | 3 | 0 | |
| | 2 | P | |
| | 1 | STATUS | > DISPATCH stack marker |
| QI | 0 | P \| D | |
| | +1 | DB BANK RETURN | > FDA DISPATCH |
| | | DB RETURN | |
| | | D \| PARM | |

P=PSEUDO-DISABLED AND DISP INSTRUCTION EXECUTED.
D=DISPATCHER INTERRUPTED.

ICS Global Cells With Initial Values

STDB - absolute address of the currently running process's stack.
SBANK - bank address for process' stack.
S - stack DB relativeS
DL - stack DB relative DL
Z - stack DB relative Z
PCBX - absolute stack address
XP - PCB table relative pointer to word D of the running process' PCB.

The above cells are to be initialized for the PROGENITOR.

CPCB - absolute 4, is an absolute version of XP. If CPCB is zero, then the above cells are invalid. This will never be the case in a process. CPCB should also be set by INITIAL.
SDST - DSTN for running process' stack.
JCUT - the bank zero absolute address of the JCUT table.
PADDR - PB relative address for the procedure PSEUDDINT.
PSTA - status value for PSEUDDINT, X140000+CSTN.
DISAP - PSDB counter, initially D.

INITIAL sets the above as described.





CS 80 Disc Interrupt Linkage Table (ILT)

There is one ILT for each device controller configured on the system. A controller may support more than one unit, however the CS'80 disc driver will only concern itself with the single unit controller.

| | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | MNEMONIC |
|---|---|---|
| 0 | Channel Program Variable Area (ICPVA) | ICPVA0 |
| 1 | | ICPVA1 |
| 2 | | ICPVA2 |
| 3 | | ICPVA3 |
| 4 | DMA Abort Address | ICPVA4 |
| 5 | | ICPVA5 |
| 6 | D | ISAQL |
| 7 | LI \| CHANQUE \| \| CHAN \| DEV | ICNTRL |
| X10 | SYSDB relative pointer to channel program area | ISIOP |
| X11 | SYSDB relative pointer to idle status area | ISTAP |
| X12 | single instruction that is executed to extract the device unit number from the status pointed to by ISTAP. [Since only Unit 0 exists on the CS'80 discs, ANDI 0 is used to return Unit 0] | IUNIT |
| X13 | SYSDB relative DIT pointer of the device currently using the channel to perform a data operation. | ICDP |
| X14 | SIOPSIZE \| CQUEN | IQUEUE |
| X15 | AW \| WP \| IG \| HCUNIT | IFLAG |
| X16 | SYSDB relative DIT pointer for unit 0 | IDITPO |
| X17 | 20 bytes status area for idle channel program | ISTAT |
| . | . | |
| . | . | |
| X31 | CS'80 Discs Channel Program | |

ICPVA0 - Channel Program Variable Area





The first word is used by the channel program processor to store status information after I/O channel aborts. The next word is used by the driver to indicate if status should be examined for special conditions or errors. The other two words are not used.

ICPVA4 - DMA abort address

If a DMA abort occurs, the absolute address where the abort occurred is stored in this area.

ICNTRL - Contains controller information

LIM -If this bit is set, the controller is sharing a software channel resource in order to limit bandwidth.

CHANQUE -The software channel resource number.

CHAN -Channel number (four most significant bits of DRTN).

DEV -Device number (three least significant bits of DRTN).

IQUEUE - The channel program contains:

SIOPSIZE - (number of words + 1)/2 in the channel program area.

CQUEN - or a multi-unit controller this field contains the software controller resource number.

IFLAG - Controller and Channel Program state flags

AUNWAIT - An Idle Channel Program should be started when there are no active requests to process.

WAITPADG - An Idle Channel Program has been started for this controller. This bit is reset by an interrupt.

IGNDAEHI - An NIOP instruction has been issued against this controller but the channel program was not in a wait statement. Therefore ignore the interrupt generated by

HCUNIT the channel code when this program halts. - Highest configured unit number for this controller.

ISTAT - 20 bytes of status from the idle channel program.

# CHAPTER 14 SPOOLING

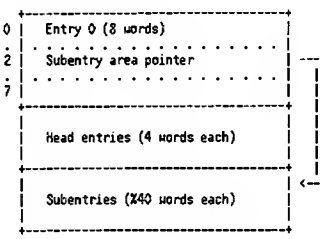
## Input Device Directory/Output Device Directory

IDD/DDD (Common attributes referred to as XDD)

IDD: DST = 45 (= X55) SIR = 3

DDD: DST = 46 (= X56) SIR = 4

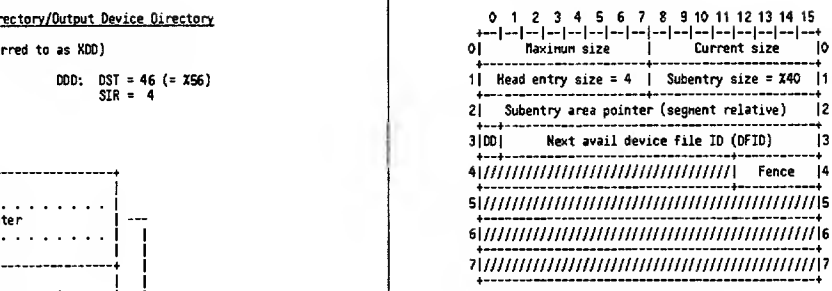
### Overview of Table Structure








### Entry 0 (Overall Table Definitions)



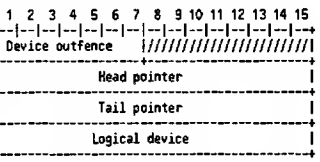

DD: 0 ==> This is the IDD,
1 ==> This is the ODD.

Fence: For spooled output devices (DDD), the system-wide outfence. For spooled input devices (IDD), the jobfence.





### Typical Head Entry (4 words)




There are two types of head entry, a class entry and a logical device entry. There is only one class entry, and it is the first head entry in the ODD. The IDD does not have a class entry, and its position is filled with zeros. All spoolfiles opened by class (e.g., LP, SLOWLP, EPOC, PP, etc.) are linked to this entry. There is one logical device entry for each real (physical, as opposed to virtual) device on the system. Output devices appear in the ODD, input devices in the IDD. AC/DC devices such as terminals appear in both directories.

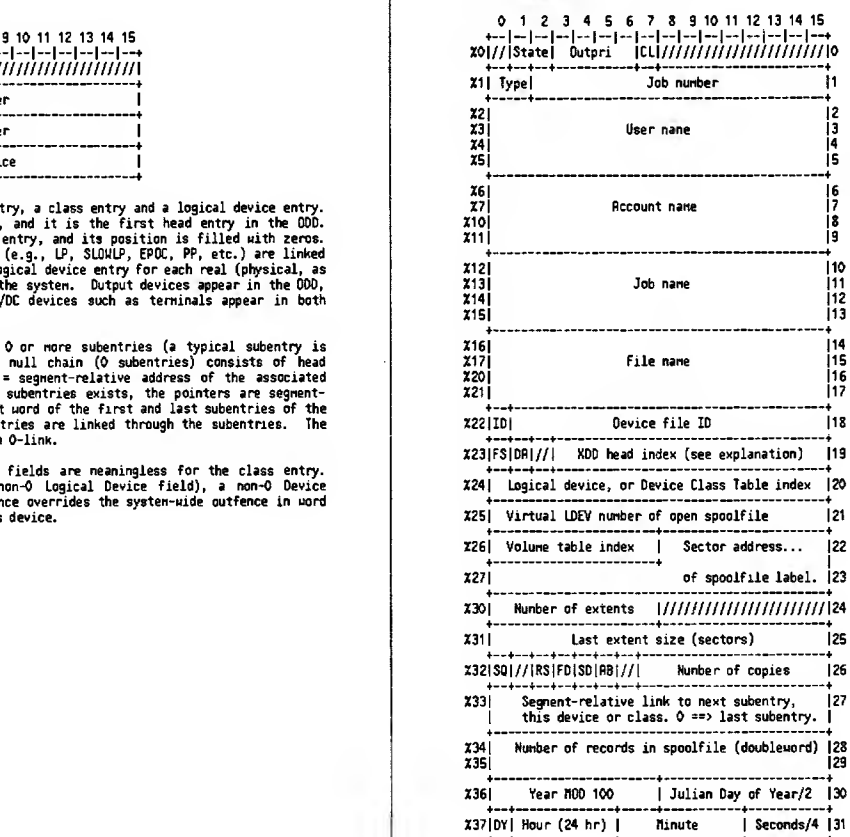
Each head entry is linked to 0 or more subentries (a typical subentry is shown in the next table). A null chain (0 subentries) consists of head pointer = 0 and tail pointer = segment-relative address of the associated head pointer. If one or more subentries exists, the pointers are segment-relative addresses of the first word of the first and last subentries of the chain. Any intermediate subentries are linked through the subentries. The tail subentry always contains a 0-link.

The Device Outfence and LDEV# fields are meaningless for the class entry. For logical device entries (non-0 Logical Device field), a non-0 Device Outfence means that this outfence overrides the system-wide outfence in word 4 of entry 0, but only for this device.





### Typical Subentry (X40 words)



Note: Words 0-X24 are used in all subentries. Words X25-X37, although present in all subentries, are zero unless the subentry is for a spooled file (spoolfile).

Word 0: State -- State of subentry:
0 ==> Active
1 ==> Ready
2 ==> Open
3 ==> Locked

CL -- 1 ==> Word X24 is a class index into the Device Class Table.
0 ==> Word X24 is the LDEV associated with this subentry.

Word 1: Type -- Describes which environment created the subentry:
0 ==> Session' (SPOOK)
1 ==> Session
2 ==> Job
3 ==> Job' (SPOOK)

Word X22: IO -- 1 ==> Output QFID
0 ==> Input QFIO

Word X23: FS -- There are one or more forms message requests in the spoolfile.

DA -- The spoolfile was created via a :DATA record (input spooling only).

Head index -- The (segment-relative address)/4 of the head entry with which this subentry is linked. Since head entries are four words long, this can be thought of as an index into the head entry portion of the XDD--if you disallow values of 0 and 1.

Word X24: -- See description of Word 0.

Word X25 VDEV -- LDOT index of virtual device LDEV. Simulates the properties of a real LDEV to the process which FOPENs a new (previously non-existing) file (State field (XDD(0). (1:2)) = 2 (Open)).

Word X26: VTINX -- The volume table index of the logical device in class SPOOL where the file label (first extent) of the spoolfile lives.

Word X32: SQ -- 1 ==> Squeeze (purge) spoolfile extents as the final copy is printed. Obsolete starting with C.00.20.
0 ==> Purge only when final copy printed.

RS -- 1 ==> Restart job when warmstarting (input spooling only).

FO -- 1 ==> There are non-standard forms on the device.

SO -- Spaced Out bit. File System could not acquire a new extent when creating spoolfile.

AB -- This is the $STDLIST of an aborted job.

Words X36-37: -- Time stamp when spoolfile was made READY, or 0D if not closed properly. Julian day in 9 bits starting with Word X36, bit 8.





## SPOOK Tape Format

The overall format of output tapes produced by the SPOOK "OUTPUT" command is shown below. The various components of the tape are then described in detail. The format described here is subject to change as MPE evolves. Also, there may be errors in SPOOK which would cause the actual tape format to differ from the one described here in some cases. All numeric information is in integer format unless otherwise specified.

EOF

EOF

Label Record

EOF

File Directory Records

Device and Class Directory Record

EOF

Spoolfile

EOF

Spoolfile

EOF

.....

Mechanisms for End-of-tape and tape switching are the same as for STORE/RESTORE tapes.

### Label Record

Words 0-13: "SPOOLFILETAPE LABEL-HP3000."

Word 23: reel number (first reel is number 1)

Word 24: date (from CALENDAR intrinsic)

Words 25&26: time (from CLOCK intrinsic)

Words 30&31: "MPEV" if an MPE V SPOOK tape





All other words are zero.

### File Directory

The File Directory has one entry for each spoolfile on the tape. Each entry is 12 words, and entries are packed into as many 1020 word records as needed. The last record will be padded with zeros if necessary. The entry format is:

Word 0: Device file id number (bit 0 is on to indicate that the file is an output spoolfile)

Words 1-3: zero

Words 4-7: User name

Words 8-11: Account Name

### Device and Class Directory

The Device and Class Directory is contained in one 1024-word record. There is no EOF separating this record from the File Directory. This directory contains one entry for each logical device or device class linked to the spoolfiles on the tape. Also, there is an entry for each logical device in each class in the directory, whether or not that logical device was directly referenced by a spoolfile. The entries are packed into the tape record one after another in no particular order. The entry formats are shown below.

### Logical Device Entry

Word 0: logical device number

Word 1: Bits 0:8 : device subtype
Bits 8:8 : 3 (=length of this entry in words)

Word 2: device type





### Device Class Entry

Word 0: Device class number (negated). This is the number of the entry of this device class in the system's Device Class Table.

Word 1: Total number of words in this entry.

Words 2 on: The entire contents of the Device Class Table entry for this device class.

### Spoolfile Format

QDO entry (32-word tape record)

Spoolfile block ---> Two spoolfile blocks packed into one
Spoolfile block 1024-word tape record.

Two spoolfile blocks

Two spoolfile blocks

.....

The first few spoolfile blocks have been modified to contain user label information from the spoolfile. This is explained later.

### Spoolfile Block Format

A spoolfile block is a 512-word block that contains variable length records in spooler format. Spoolfile records start at the first word of the block. The last record is followed by a -1 to indicate that no more records follow. The last two words of the block contain a doubleword which is the record number of the first record in the block.

### Spoolfile Record Format

Word 0: Byte count of record - 2

Word 1. Byte count of data portion of record. Note that this count includes trailing blanks. However, trailing blanks are truncated in

the actual record, so this count may be more than the number of bytes actually present in the data portion.

Word 2: Function Code: 1=Fwrite
2=Fcontrol
3=Fopen
4=Fclose
%100 and beyond=FDEVICECONTROL

Word 3: P1 -- ATTACHIO parameter

Word 4: P2 -- ATTACHIO parameter

Words 5 on: Data Portion of Record

User Labels Information

Spoolfiles have a number of user labels with several kinds of information. These are:

1. Master: user label 0.
2. FOPEN entry catalog: user labels 1-10.
3. Circular queue for restart checkpointing: user labels 11-27.

Since older versions of MPE did not use user labels, a way was needed to incorporate them into the SPOOK tape format without losing forward and backward compatibility. The method used is to add several special spoolfile blocks to the beginning of the spoolfile on tape. Each of these blocks has exactly one FOPEN record at its beginning. This record is followed by a -1. Thus old versions of MPE will assume that the rest of the block is garbage. However, the rest of the block is actually used to contain user label information. The first two spoolfile blocks (i.e. the first tape record of the spoolfile proper) contain only the FOPEN records. The next 5 tape records actually contain user labels in addition to the FOPEN records. The user labels are packed 3 to a spoolfile block, 6 to a tape record. Each spoolfile block of 512 words has the following format:

Words 0-4: FOPEN record

Word 5: -1 (to "terminate" the block)

Words %200-%377: user label

Words %400-%577: user label

Words %600-%777: user label



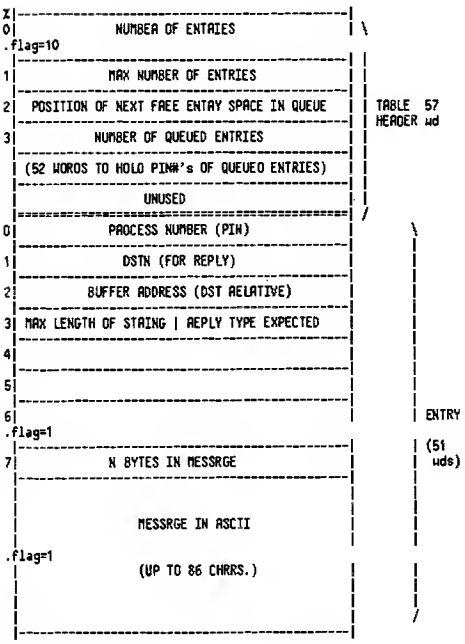


Following this special group of blocks, the spoolfile resumes a normal format. The special FOPEN records all have the number of user labels in P2.

It is often the case that some of the 27 user labels have not been initialized before the tape is written. In that case, their places will be filled with garbage. There is no easy way of detecting this except by careful inspection.

CHAPTER 15 UNIFIED COMMAND LANGUAGE (UNCL)

Reply Information Table (RIT)
DST X34; SIR X25




NOTE: Process Number = 0 means entry is empty
Reply Type = 0 for number (num)
= 1 for yes or no (y/n)
= 2 for string (sxx)
= 3 for yes, no, or STRING





```
.flag=2
          = 4 for string
  TABLE SIZE = 2046 words
.flag=2
  MAX N OF ACTIVE ENTRIES = 39
  MAX # OF QUEUED ENTRIES = 52
```

Message System General Description

The message system consists of the following parts:
- Callable intrinsic GENMESSAGE.
- Uncallable procedure GENMSG which is used by MPE.
- System message catalog (CATALOG.PUB.SYS) and any number of user catalogs.
- Program MAKECAT which builds message catalogs.
- MESSAGE SIR X24
- MESSAGE SYSGLOB CELLS X371-373
- MESSAGE ORTR SEGMENT

The message system is used by calling GENMESSAGE (or GENMSG) with a message number. The message system fetches the message from a message catalog, inserts parameters, then routes the message to a file or returns the message in a buffer to the caller.

A message catalog is a numbered editor-type file containing sets of messages. The sets serve to break a catalog into manageable portions. A message system user may call GENMESSAGE using either his own message catalog or using MPE's catalog (CATALOG.PUB.SYS).

After creating a message file, run the program MAKECAT in order to build a catalog that is readable by the message system. This file is still readable by the editor (it can be "texted") but it contains a directory (written as a userlabel).

In order to use the message catalog, the program must first open the message catalog, then call GENMESSAGE with the file number, set number and message number. (MPE users don't need to open the catalog, GENMSG automatically uses CATALOG.PUB.SYS.) The file must be opened with the aoptions "NOBUF" and "MULTI" -record access.





Message Catalog

Messages in the catalog can be of any length and can contain up to five parameters. Continuation of a message is indicated by "%" or "&" at the end of a line. The "%" symbol indicates that the message is continued and that a carriage return, line feed be issued the terminal. The "&" symbol indicates that the message is continued on the same line with no carriage return, line feed.

Parameters may be inserted into the message fetched from the catalog. The parameters are passed in the GENMESSAGE (or GENMSG) call and inserted wherever a "!" is found. For the system message catalog, the back slash (\) is also a parameter, reflecting a logical device number. The message is routed to the user associated with that logical device through the :RSSOCIATE command. Message sets are indicated by "$SET n" starting in column 1 (the rest of the line is treated as a comment). Maximum value for n is 63. Comments can be inserted in the catalog by placing "$" in column 1. Message numbers are positive integers, need not be contiguous, but must be in ascending order. After processing by the program MAKECAT, the catalog file contains records of 80 bytes, blocked 16, in 32 extents. (The system message catalog is only one extent, however). The format of the message catalog is as follows:

```
$SET 1    SYSTEM MESSAGES
1 LDEV #! IN USE BY FILE SYSTEM
2 LDEV #! IN USE BY DIAGNOSTICS
3 LDEV IN USE, DOWN PENDING
5 IS "!" ON LDEV#! (Y/N)?
   .
   .
$ MESSAGE 35 IS TWO LINES LONG, R PARAMETER STARTS THE
$ FIRST LINE AND THE SECOND LINE IS "MP32002"
35 !%
MP32002B.00.!
   .
   .
   .
276 LDEV # FOR "!" ON ! (NUM)!
$
$SET 2 CIERROR MESSAGES
82 STREAM FACILITY NOT ENABLED:  SEE OPERATOR.  (CIERR 82)
200 MORE THAN 30 PARAMETERS TO BUILD COMMAND.  (CIERR 200)
   .
   .
   .
204 FILE COMMAND REQUIRES AT LEAST TWO PARAMETERS, INCLUDING
```





```
   THE
    FORMAL NAME OF THE FILE  (CIERR 204)
      .
      .
```

MAKECAT Program

The program MAKECAT.PUB.SYS is used to build message catalogs (and also HELP catalogs). The program's input file has the formaldesignator INPUT, which must be used for all entry points. The program has the following entry points:

(no entry point) - Reads from input file and builds a temporary file (formaldesignator CATALOG). Also renames any old temporary CATALOG, CATnn, using an archival numbering scheme (i.e., CAT1, CAT2, etc.).

BUILD - (Must log on under MANAGER.SYS.) Reads from input file, build the system message catalog (formaldesignator CATALOG), and installs the message system. Existing catalog is renamed CATnnnn according to the same scheme as for no entry point (above). Installation of the message system means moving the directory contained in the userlabel of the catalog into a data segment. The DST number and the disc address of CATALOG are placed in system global area. The message system may be installed while the system is running.

DIR - (Must have PM or OP capability.) Installs the system message catalog (does not build a new one). Opens input file, moves the directory in the CATALOG into a data segment, and places the DST number and disc address of CATALOG in system global area. This may be done when the message system seems to be "broken", but the catalog is intact. (MPE is issuing "MISSING MSG. SET=nn. MSG=nn" at terminals and at the console.) This may be done while the system is running.

HELP - Used to build the HELP catalog. Reads input file and builds a HELP catalog (formaldesignator HELPCAT).

## Message System CATALOG.PUB.SYS

```
$SET 1  - System messages.
$SET 2  - CI errors and warnings messages.
$SET 3  - Miscellaneous ABORT messages.
$SET 4  - Program error abort messages.
$SET 5  - Intrinsics abort messages.
$SET 6  - Run-time abort messages.
$SET 7  - CI general messages.
$SET 8  - File System error messages.
$SET 9  - Loader error messages.
$SET 10 - CREATE error messages.
$SET 11 - ACTIVATE error messages.
$SET 12 - SUSPEND error messages.
$SET 13 - MYCOMMAND error messages.
$SET 14 - LOCKGLOBIN error messages.
$SET 15 - Private Volumes error messages.
$SET 16 - OS/3000 messages.
$SET 17 - HELP facility error messages.
$SET 18 - Graphic devices messages.
$SET 19 - Serial Disc error messages.
$SET 20 - User Logging error messages.
$SET 21 - Association Utility (ASOCTABL) messages.
$SET 22 - 2680R Page Printer messages.
$SET 25 - 2680R Page Printer error file messages.
$SET 26 - Disc Free Space messages.
$SET 27 - System Internal Error messages.
```



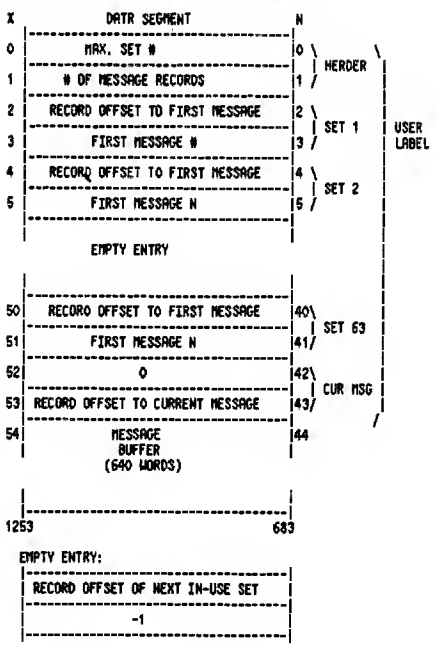


## Message Set Directory

DST # IN SYSGLOB X373

CRT DISC ADDR IN SYSGLOB X371-372

CREATED BY RUNNING MAKECRT.PUB.SYS.
KEPT IN R DATA SEGMENT AND IN A USER LABEL.




EMPTY ENTRY:

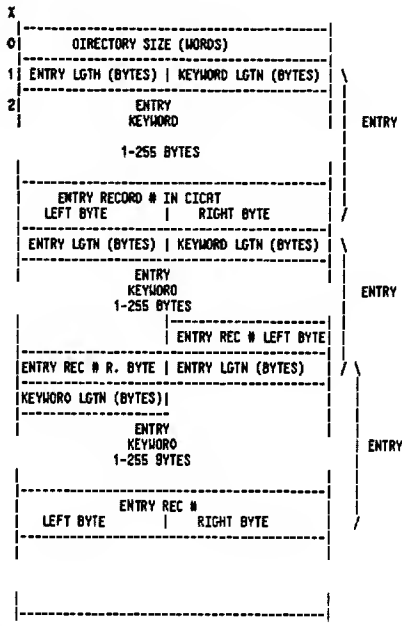
| RECORD OFFSET OF NEXT IN-USE SET |
|---|
| -1 |





## HELP Subsystem

KEPT AS USER LABEL
READ ONTO USER'S STACK
USES SEARCH INTRINSIC FORMAT
VARIABLE ENTRY SIZE



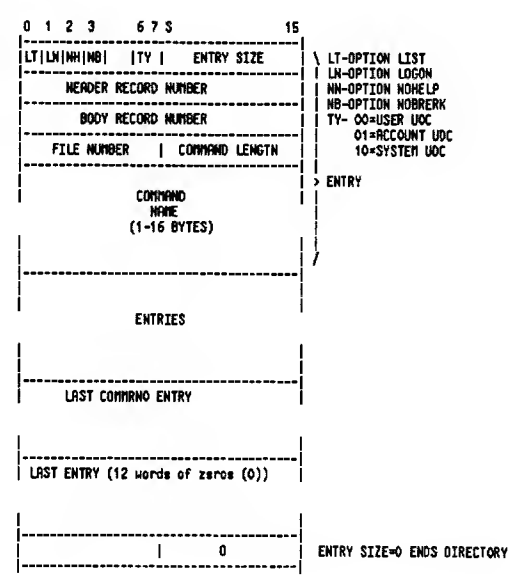





## UDC Directory

*EXTRA DATA SEGMENT - DST # IN DB+X255 OF UMAIN STACK

*BUILT BY INITUDC



UDC's COMMAND.PUB.SYS

*RECORD SIZE = 20(10) WORDS, 6 RECORDS/BLOCK

*KEEPS TRACK OF WHO IS USING WHAT UDC CATALOG

*CAN BE PURGED TO DISABLE UDC'S

*CAN BE REBUILT TO RE-ENABLE UDC'S

| % | RECORD 0 | # |
|---|---|---|
| 0 | 1st FREE ENTRY # | 0 |
| 1 | not used | 1 |
| 2 | MAX IN USE | 2 |
| 3 | # IN USE | 3 |
| 4 | not used | 4 |
| 23 | | 19 |

| % | FREE ENTRY | # |
|---|---|---|
| 0 | NEXT FREE ENTRY # | 0 |
| 1 | ENTRY TYPE=0 | 1 |
| 2 | not used | 2 |
| 23 | | 19 |





COMMAND.PUB.SYS (Cont.)

| % | USER ENTRY | # |
|---|---|---|
| 0 | CATALOG ENTRY # | 0 |
| 1 | ENTRY TYPE=1 | 1 |
| 2 | USER* | 2 |
| 3 | | 3 |
| 4 | | 4 |
| 5 | | 5 |
| 6 | | 6 |
| 7 | ACCOUNT* | 7 |
| 10 | | 8 |
| 11 | | 9 |
| 12 | | 10 |
| 13 | not used | 11 |
| 14 | | 12 |
| 15 | | 13 |
| 16 | | 14 |
| 17 | | 15 |
| 20 | | 16 |
| 21 | | 17 |
| 22 | | 18 |
| 23 | | 19 |

| % | FILE ENTRY | # |
|---|---|---|
| 0 | NEXT CAT. ENTRY # | 0 |
| 1 | ENTRY TYPE = 2 | 1 |
| 2 | FILE NAME | 2 |
| 3 | | 3 |
| 4 | FOPEN FORMAT: | 4 |
| 5 | | 5 |
| 6 | FILE | 6 |
| 7 | [/LOCKWORD] | 7 |
| 10 | GROUP | 8 |
| 11 | ACCOUNT | 9 |
| 12 | 0 | 10 |
| 13 | | 11 |
| 14 | | 12 |
| 15 | (UP TO 36 BYTES) | 13 |
| 16 | | 14 |
| 17 | | 15 |
| 20 | | 16 |
| 21 | | 17 |
| 22 | | 18 |
| 23 | | 19 |

* IF THE USER FIELD AND THE ACCOUNT FIELD CONTAIN "@_____",
THIS INDICATES SYSTEM LEVEL UDC'S.

IF ONLY THE USER FIELD CONTAINS @ AND 7 SPACES, THIS INDICATES
ACCOUNT LEVEL UDC'S.





CI Stack Definition

| | |
|---|---|
| QB+%0 | BCOMIMAGE (Byte Ptr. To Command) |
| QB+%1 | COMMAND IMAGE (280 bytes) |
| QB+%215 | LINELENSTACK (30 words) |
| QB+%253 | NEXTMSG (Not currently used) |
| QB+%254 | THIS IS SPARE |
| QB+%255 | UDC0 |
| QB+%256 | UDC1 |
| QB+%257 | UDC2 |
| QB+%260 | UDC3 |
| QB+%261 | UDC4 |
| QB+%262 | IFNESTING |
| QB+%263 | IFSKIP |
| QB+%264 | ELSESEEN |
| QB+%265 | CIFLAGS |
| QB+%266 | CONTINUE STATE STACK (2 words) |
| QB+%270 | PENDINGCOMLEN |
| QB+%271 | BLASTCOMIMAGE (Byte Ptr.) |
| QB+%272 | LAST COMMAND IMAGE (280 bytes) |





Field Definitions

BCOMIMAGE: Byte pointer to COMIMAGE (sometimes called WCOMIMAGE) in the CI stack.

COMMAND IMAGE: Command character string currently being executed.

LINELENSTACK: A CI command can span up to 30 input lines. This stack holds the length of each input line.

NEXTMSG: Used to be used to link messages together. No longer being used.

THIS IS SPARE: Not used.

UDC0: Holds the OST number of the UDC definitions.

UDC1: Holds the old S register value for UDC's.

UDC2: (0:1)--FLUSHUDC, used by :SETCATALOG

UDC3: (0:1)--OPTION LIST = 1
(1:1)--OPTION LOGON = 1
(2:1)--OPTION NONELP = 1
(3:1)--OPTION NOBREAK = 1

UDC4: (0:1)--UDC Fatal Ci Error
(1:1)--UDC EXITBREAK
(2:1)--UDC BREAKDETECTED
(3:1)--UDC NOPRIV
(4:1)--UDC IMAGEADJUST
(10:6)--UDC NESTLEVEL

IFNESTING: Level of nesting of :IF commands.

IFSKIP: Whether the current commands are being skipped as the false part of a :IF command.

ELSESEEN: Level of the :ELSE commands.

CIFLAGS: (13:1)--Sequenced: line numbers at rear.
(15:1)--Not READable (last command).

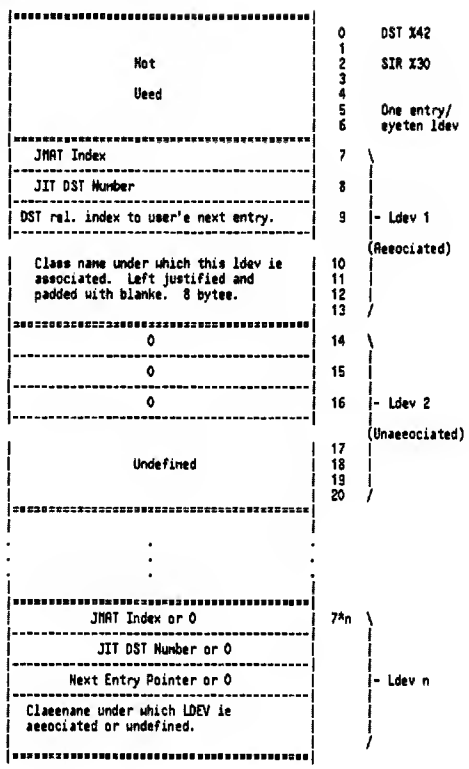
CONTINUE STATE STACK: History of the :CONTINUE commands.
= 0--no :CONTINUE
= 1--just seen
= 2--in effect.

PENDINGCOMLEN: If <> 0, command is already in stack and this word is the command string length.

BLASTCOMIMAGE: Byte pointer to last command image.

LAST COMMAND IMAGE: When a command completes execution, the command string is copied here for use by the :REDO command.

## Association DST Layout








## Application Message Facility

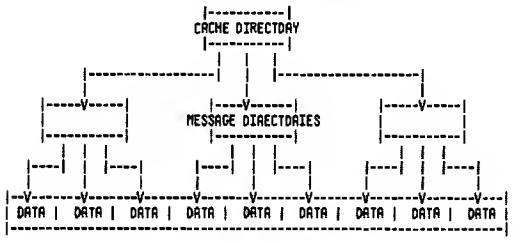
The Application Message Facility consists of two parts: GENCAT, the catalog maintenance facility, and the "CAT" intrinsics, through which the message catalogs are accessed. The "compiled" catalog, which GENCAT creates, contains an extensive directory at the front of the file which describes where every message in the catalog is located. When a message catalog is opened (via CATOPEN) part of this directory is read into an extra data segment which is created specifically for that purpose. This "caching" of the directory provides nearly direct access to the desired message.

These messages include message set number, message numbers, and record numbers placed or "cached" into 384 word message caches. The first set number and message number of each message cache is placed into a cache directory (set and message numbers must be ascending). A message is found by scanning first the cache directory, then the message cache searching for the desired set and message number. The retrieved message directory entry contains the record number in the catalog file of that message. Now, the catalog file can be read directly using the record number.

Internally, the two layer directory format is used by both the formatted application message catalog, and the message extra data segment created by the intrinsic CATOPEN (and used by CATREAD).

The catalog files created for MAKECAT and GENCAT may be used with the Application Message Facility. In most cases, applications will increase their performance in message routing and decrease the file space with formatted catalogs.

### NLS Message Catalog/DST Overview

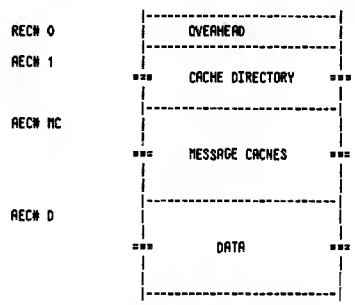



The maximum catalog size is 65536 sectors long. The largest set number is 255. The largest message number is 64766, while the smallest set and message number is 1.





## Formatted Catalog File Structure




where MC = 2 + (2 * #message caches )/128
D = MC + (384 * #message caches )/128

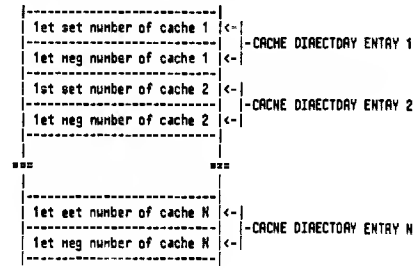
Each physical record is one sector long (128 words). Each structure starts on a sector boundary.





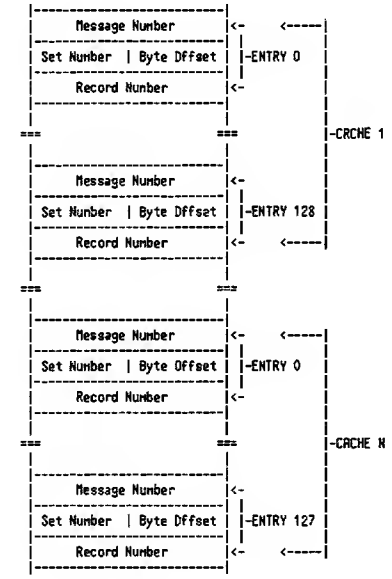
## Cache Directory

Each entry in the cache directory is a two word entry. There exists one cache directory entry for each 384-word message cache. The first word of the cache directory entry is the set number of the first entry in the associated message cache. The second word of the cache directory entry is the message number of the first entry in the associated message cache.



## Message Cache Format

Each message cache is 384 words long (3 records). A message cache entry is 3 words long, 128 entries per message cache. Each entry contains the message number and set number of the message. The byte offset is the offset to the start of the message in the record specified by the record number. Entry 127 is a duplicate of the first entry in the next cache. This is to allow the total number of bytes of the message to be computed without reading the next message cache.







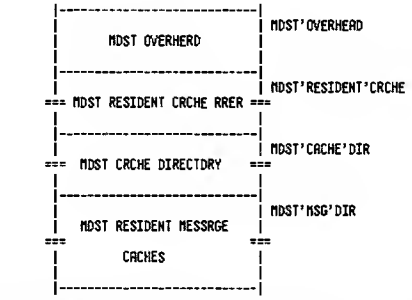

## Data Format

The format of the messages is straight forward. It contains only the text of the message. It contains no comment records, message numbers or set numbers. All leading and trailing blanks are stripped from the message.

## Message DST (MDST) Structure

An message extra data segment is allocated during a CATOPEN. The data segment number is kept by the application on the return from CRTOPEN. The format of the data segment is similar of that of the formatted message catalog. The main difference is the addition of a table to track resident caches in the DST, and the catalog data in not kept in the DST.

## Message DST Overview




NOTE: A resident cache is a message cache copied from the formatted catalog. Resident caches are swapped in and out of the MDST and are used to determine the record number of the desired set and message.





## Message DST Overhead

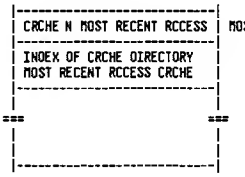
| | | |
|---|---|---|
| 0 | "M" \| "D" | MDST'ID |
| 1 | "S" \| "T" | |
| 2 | Size of MDST ( in words ) | MDST'SIZE |
| 3 | Catalog File Number | MDST'CRT'FNUM |
| 4 | Offset to Resident Cache | MDST'RESIDENT'CACHE |
| 5 | Offset to Cache Directory | MDST'CACHE'DIR |
| 6 | Offset to Msg directories | MDST'MSG'DIR |
| 7 | Cache Directory Size (wds) | MDST'CDIR'SIZE |
| 8 | Msg directory size (wds) | MDST'DIR'SIZE |
| 9 | Max num of resident cache | MDST'CACHE'MAX |
| 10 | Recnum of first msg dir. | MDST'FIRSTDIR'RECNUM |
| 11 | Reserved | |
| 12 | Reserved | |





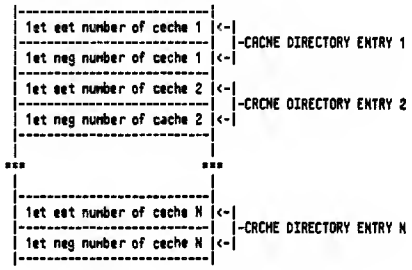
## Message DST Resident Cache Area

The Resident Cache Area is a table of the message directory blocks currently stored in the MDST, together with their index. They are held in order from the most recently accessed at the top to the and the oldest on the bottom. The maximum number of caches held in the MDST at any one time is MDST'CACHE'MAX.



## MDST Cache Directory

Each entry in the cache directory is a two word entry. There exists one cache directory entry for each 384 word message cache. The first word of the cache directory entry is the set number of the first entry in the associated message cache. The second word of the cache directory entry is the message number of the first entry in the associated message cache.

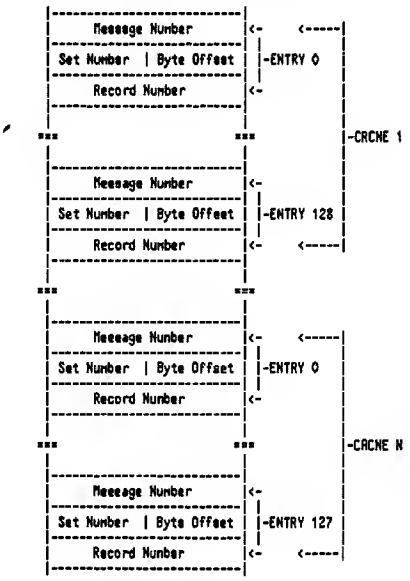







## MDST Message Cache Format

Each message cache is 384 words long (3 records). A message cache entry is 3 words long, 128 entries per message cache. Each entry contains the message number and set number of the message. The byte offset is the offset to the start of the message in the record specified by the record number. Entry 127 is a duplicate of the first entry in the next cache. This is to allow the total number of bytes of the message to be computed without reading the next message cache.



CHRPTER 16 SYSDUMP/INITIAL

CONFDRTR file

Record 0 of CONFDATR File (CTAB0)

| | | |
|---|---|---|
| 0 | CHECKSUM OF CTAB | 0 |
| 1 | CURRENT VERSION OF CTAB | 1 |
| 2 | STANDARD STACK SIZE | 2 |
| 3 | CORESIZE IN K WORDS | 3 |
| 4 | TERMINAL BOUND PRIORITY | 4 |
| 5 | NORMAL PRIORITY | 5 |
| 6 | CPU BOUND PRIORITY | 6 |
| 7 | # OF SECONDS TO LOG-ON | 7 |
| 10 | LOG FILE RECORD SIZE (SECTORS) | 8 |
| 11 | LOG FILE SIZE (RECORDS) | 9 |
| 12 | ////////////////////////////////////////////// | 10 |
| 13 | LOG BITS (ONLY 11 USED) | 11 |
| 14 | | 12 |
| 15 | <<DEFINES WHAT IS BEING LOGGED>> | 13 |
| 16 | | 14 |
| 17 | | 15 |
| 20 | DEFAULT JOB/SESSION CPU TIME LIMIT | 16 |
| . | ////////////////////////////////////////////// . | |
| . | ////////////////////////////////////////////// . | |
| . | ////////////////////////////////////////////// . | |
| 34 | MAXIMUM OPEN SPOOL FILES | 28 |
| 35 | ////////////////////////////////////////////// | 29 |
| 36 | MAXIMUM # OF SPOOL FILES (KILO SECTORS) | 30 |
| 37 | | 31 |
| 40 | ////////////////////////////////////////////// | 32 |
| 41 | # SECTORS PER SPOOL EXTENT | 33 |





Record 1 of CONFDATA File (CTRB)

| | | |
|---|---|---|
| 0 | # OF CST ENTRIES | 0 |
| 1 | # OF OST ENTRIES | 1 |
| 2 | # OF PCB ENTRIES | 2 |
| 3 | # OF IOD ENTRIES | 3 |
| 4 | # OF TERMINAL BUFFERS | 4 |
| 5 | # OF CST EXTENSION ENTRIES | 5 |
| 6 | INTERRUPT CONTROL STACK SIZE (01 to Z1) | 6 |
| 7 | # UCOP REQUEST QUEUE ENTRIES | 7 |
| 10 | # BREAKPOINT ENTRIES | 8 |
| 11 | # TRL ENTRIES | 9 |
| 12 | # OF RINS | 10 |
| 13 | # GLOBAL RINS | 11 |
| 14 | # OF SYSTEM BUFFERS | 12 |
| 15 | # OF CONCURRENT PROGS | 13 |
| 16 | LORDER SEGMENT SIZE | 14 |
| . | ////////////////////////////////////////////// . | |
| . | ////////////////////////////////////////////// . | |
| . | ////////////////////////////////////////////// . | |
| 24 | SIZE OF VIRTUAL MEMORY | 20 |
| 25 | DIRECTORY SIZE (SECTORS) | 21 |
| . | ////////////////////////////////////////////// . | |
| . | ////////////////////////////////////////////// . | |
| . | ////////////////////////////////////////////// . | |





CONFDRTA (Cont.)

| | | |
|---|---|---|
| 36 | MAXIMUM CODE SEGMENT SIZE | 30 |
| 37 | MAXIMUM # OF CODE SEGMENTS/PROCESS | 31 |
| 40 | MAXIMUM STACK SIZE (MAXDATA) | 32 |
| 41 | MAXIMUM EXTRA DATA SEGMENT SIZE | 33 |
| 42 | MAXIMUM # OF EXTRA DATA SEGMENTS/PROCESS | 34 |
| . | ////////////////////////////////////////////// . | |
| . | ////////////////////////////////////////////// . | |
| . | ////////////////////////////////////////////// . | |
| 50 | MAXIMUM # RUNNING SESSIONS | 40 |
| 51 | MAXIMUM # OF RUNNING JOBS | 41 |
| 52 | # LOG PROCS | 42 |
| 53 | LOG IO's | 43 |
| 54 | # DISC REQUEST TABLE ENTRIES | 44 |
| 55 | # SPECIAL REQUEST TABLE ENTRIES | 45 |
| 56 | # PRIMARY MESSAGE TABLE ENTRIES | 46 |
| 57 | # SWAP TABLE ENTRIES | 47 |
| 58 | # SECONDARY MESSAGE TABLE ENTRIES | 48 |





INITIAL/PROGEN Communication DST

The INITIAL/PROGEN Communication data segment is used by Initial to pass information to PROGEN. This segment is only temporary and not memory resident.

COMMDSTN = SYSGLOBEXT (X122) DST (SYSGLOBEXT (X122))

| 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | # | |
|---|---|---|
| POINTER TO THE START OF CTAB0 | 0 | |
| POINTER TO THE START OF CTAB | 1 | |
| SYSTEM START-UP OPTION | 2 | OPT |
| RECOVER LOST DISC SPACE PROGRAM | 3 | Recovery |
| RESERVED | | |
| CTRB0 ARRAY (Record 0 of the CONFDATR file) | 256 | = X400 |
| CTRB ARRAY (Record 1 of the CONFDATA file) | 256 + CTAB0 size | |

DESCRIPTIONS

OPT = Start-up option
- 0 = Warmstart
- 1 = Coolstart
- 2 = Coldstart
- 3 = Update
- 4 = Reload

Recovery = 1 If Recover Lost Disc Space
= 0 If Not Recover Lost Disc Space

CTRB & CTRB0 -See the descriptions of CONFDTR file in this chapter.

The microcode will store the CNTRL B command into (01-11) equivalent to (RBS(5)-11) for the Series 37.

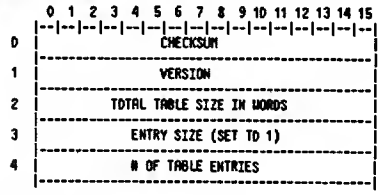
CNTRL B
- 0 = Start
- 1 = Warmstart
- 2 = Coolstart
- X10 = Load
- X11 = Update
- X12 = Coldstart
- X13 = Reload
- X14 = New
- X20 = Dump

Starttype = ABS (ABS (5)-11)

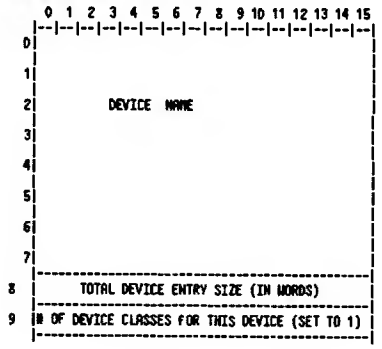
## Defdata Table Lookup File

This file contains the default information for HP-supported devices. This file, DEFDATA.PUB.SYS, is available to Sysdump and Initial and eliminates the necessity for looking up default information every time a device is added to the system. Despite its name, DEFDATA.PUB.SYS in not only a file, but a table in the Coldload Information Table. It is not easily modified. Therefore, it is recommended that the file be left alone; if any user is unhappy with the defaults, they can be overridden during the Sysdump or Initial dialogues.

### Defdata Table Lookup File Header Format



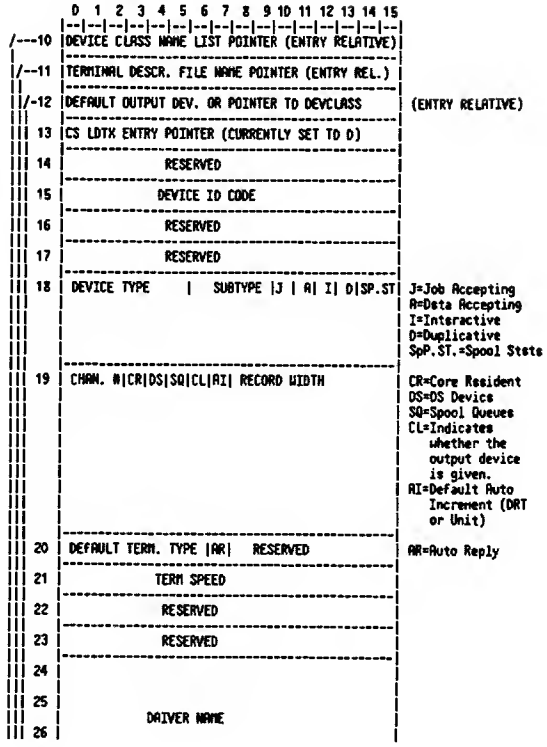

### Defdata Table Lookup File Entry Format







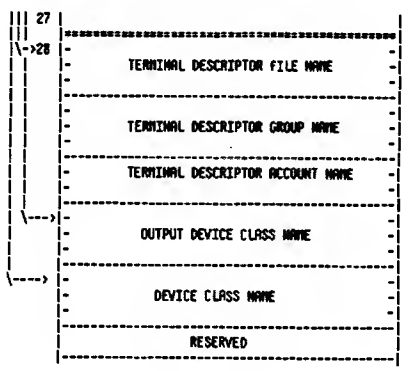

### Defdata Table Lookup file Entry Format (Cont.)








### Defdata Table Lookup file Entry Format (Cont.)

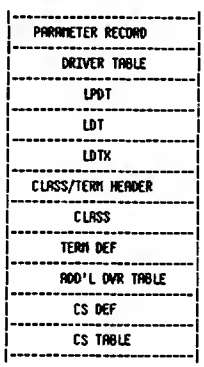




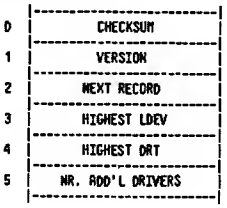



## DEVDATA.PUB.SYS

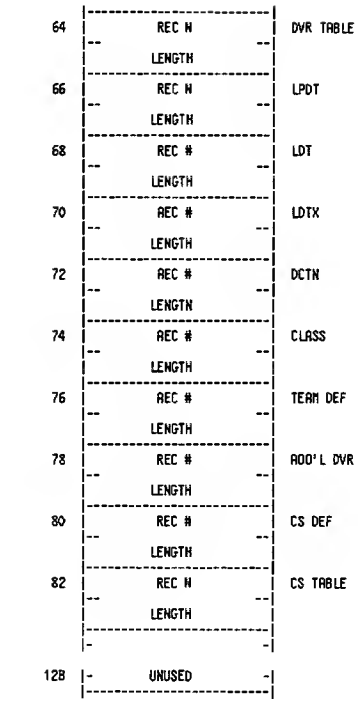
### Overview




### Parameter Record



Parameter Record (Cont.)

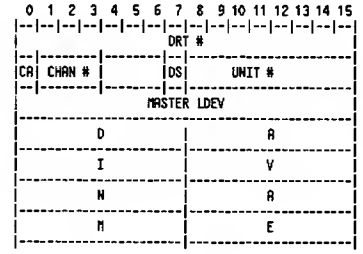







Driver Table

The Driver Table consists of 7 word entries, in correspondence to the LDEV entries, up to the highest LDEV used, entry zero is a dummy entry.




TYPICAL ENTRY FORMAT

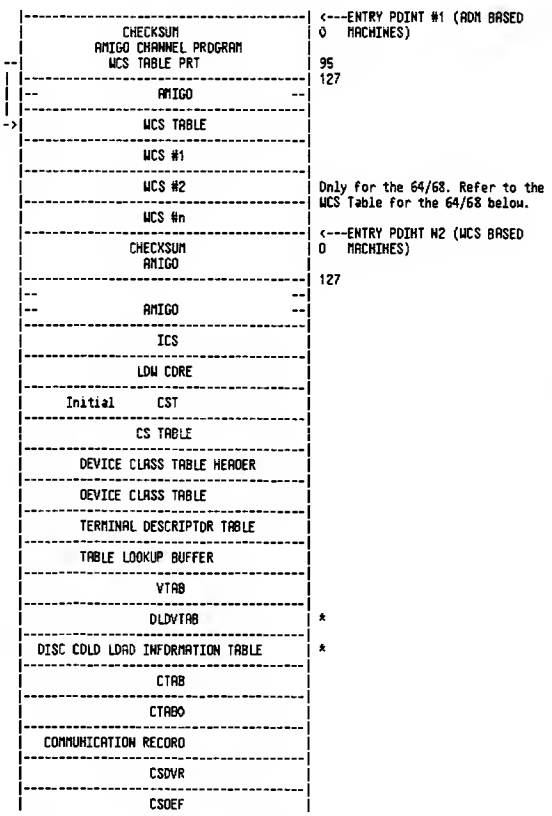
OS — DS DEVICE (if set DAT is zero)
CR — CORE RESIDENT
CHAN # — CHANNEL #
MASTER LDEV — LDEV of device which this DS device is linked to.

Words 3-7 contain the driver name.





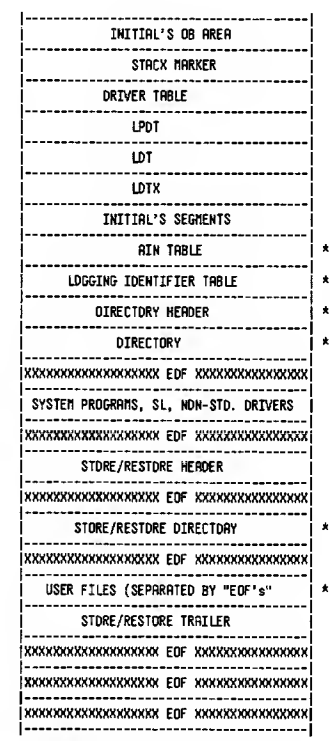
SYSDUMP Format







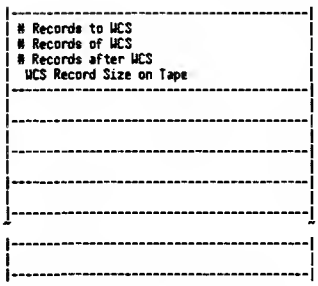

SYSDUMP Format (Cont.)




* NOT DUMPED IF DATE = CARRIAGE RETURN

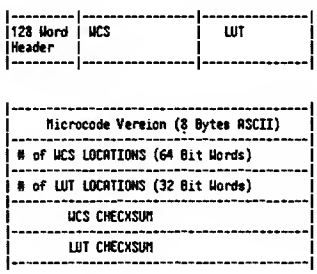
NOTE: ON DISC, READ-SIO-PROGRAM KEPT IN DISC LABEL.

## WSC Table Format




Note: Currently only one entry used (Entry 4, by Series 64).

## Series 64/68 WCS Table Format

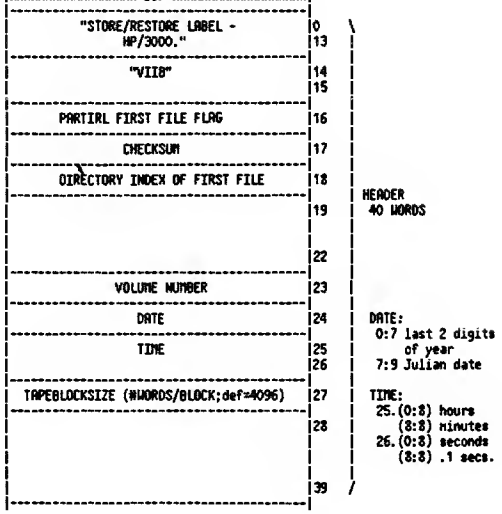







## Store Tape Format

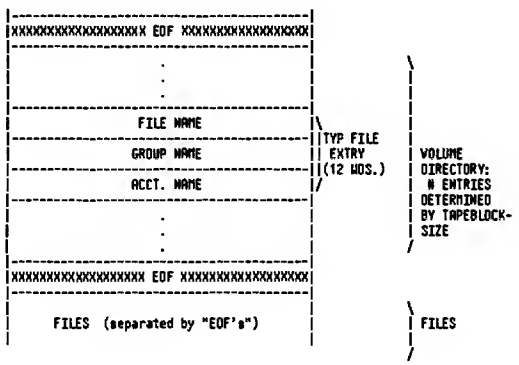
First Volume







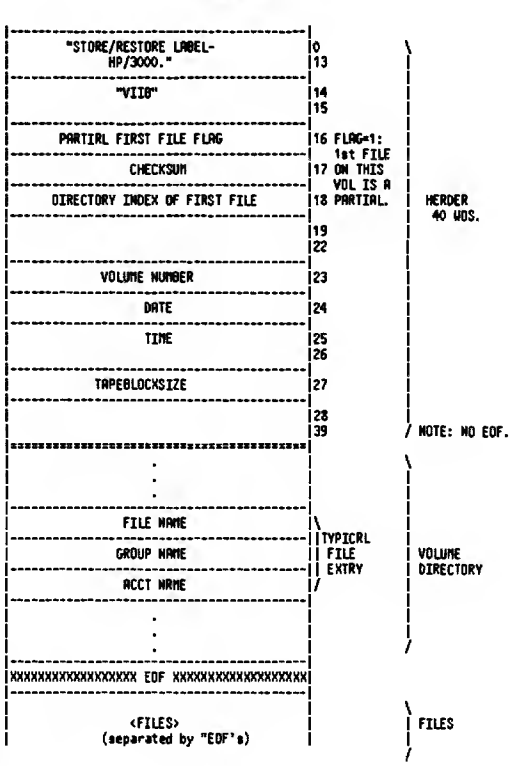

First Volume (Cont.)



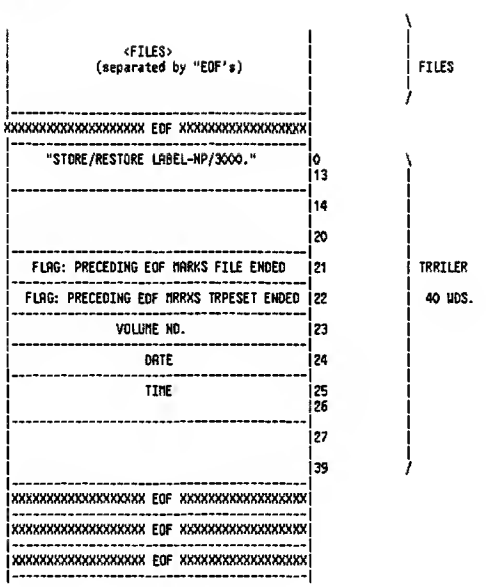





## Subsequent Volumes



End of Volume



# CHAPTER 17 MISCELLANEOUS

## Labeled Tape Subsystem

The MPE labeled tape subsystem permits convenient access to tapes labeled to either ANSI or IBM standards. It operates as a set of subprocedures to the file system. A labeled tape consists of one or more logical files. Each logical file consists of three physical files, i. e. tape areas delimited by tapemarks. The first physical file contains header labels, the second contains the data, and the third contains trailer labels which are (except for minor differences) copies of the header labels. The tape mark following trailer labels will be followed either by header labels for the next file, or by another tapemark if there is no next file. Labels are 80 bytes long, and conventionally are identified by their first four characters (three letters and a digit) and contain information as follows (CP := character position; L:= length):

VOL1: Present only on the first file of a volume, the volume label contains the volume identifier, which is usually the number on the tape strap, and is thus not expected to be changed.

| CP | Field Name | L | Content |
|---|---|---|---|
| 1/3 | Label identifier | 3 | "VOL" |
| 4 | Label Number | 1 | "1" |
| 5/10 | Volume Identifier | 6 | Vol ID |
| 11 | Accessibility | 1 | "0" if IBM, else " " |
| 12/79 | Not used | 62 | Blanks |
| 80 | Label-Standard Version | 1 | "1" if HP ANSI else " " |

UVLn: User volume labels. May be present on tapes from foreign shops, but are not written by MPE. If encountered, they are ignored.





HDR1: First header label. Required for each file. Specifies:

| CP | Field Name | L | Content |
|---|---|---|---|
| 1/3 | Label identifier | 3 | "HDR" |
| 4 | Label Number | 1 | "1" |
| 5/21 | File Identifier | 17 | File name, if tape was not written by MPE, only the first eight are significant. |
| 22/27 | Volume Set Identifier | 6 | Names the volume on which the set of files begins |
| 28/31 | Reel Number | 4 | Counts the reels that contain this file (1 starts) |
| 32/35 | File sequence number | 4 | Counts the files in the set of files (1 starts) |
| 36/41 | Not Used | 6 | MPE writes blanks |
| 42/47 | Creation Date | 6 | Year and day within year when the file was written. |
| 48/53 | Expiration Date | 6 | Year and day within year when the file may be over-written without permission. |
| 54 | Accessibility | 1 | %230 if Lockword, "0" if IBM |
| 55/60 | Block count | 6 | Number of blocks if IBM. |
| 61/73 | System Code | 13 | "HP MPE 3000 " |
| 74/80 | Not Used | 7 | Blanks |





HDR2: Second header label. Although defined by the standard, may be missing on foreign tapes. Contains:

| CP | Field Name | L | Content |
|---|---|---|---|
| 1/3 | Label identifier | 3 | "HDR" |
| 4 | Label Number | 1 | "2" |
| 5 | Record Format | 1 | "F" = fixed<br>"V" = Variable<br>"U" = Undefined<br>Others treated as Undefined |
| 6/10 | Block Length | 5 | Block length (in character format). |
| 11/15 | Record Length | 5 | Record length (adhering to to MPE rules) in characters. |
| 16/23 | Lockword | 8 | MPE File Lockword. |
| 24/36 | Not Used | 13 | MPE writes blanks |
| 37 | Record Type | 1 | "A" = ASCII<br>"B" = Binary. |
| 38 | Carriage Control | 1 | "C" = control<br>" " = no control. |
| 39/80 | Not Used | 42 | Blanks |





IBM has a slightly different format. It is:

| CP | Field Name | L | Content |
|---|---|---|---|
| 1/3 | Label identifier | 3 | "HDR" |
| 4 | Label Number | 1 | "2" |
| 5 | Record Format | 1 | "F" = Fixed<br>"V" = Variable<br>"U" = Undefined<br>Others treated as Undefined |
| 6/10 | Block Length | 5 | Block length (in character format). |
| 11/15 | Record Length | 5 | Record length (adhering to to MPE rules) in characters. |
| 16 | Not Used | 1 | Blank. |
| 17 | IBM Position | 1 | "0" = no volume switch<br>"1" = a switch has occurred. |
| 18/38 | Not Used | 11 | Blanks. |
| 39 | IBM Block Attribute. | 1 | "B" = Blocked records.<br>"S" = Spanned records.<br>"R" = Blocked and Spanned.<br>" " = No blocked or spanned. |
| 40/80 | Not Used | 41 | Blanks |

User header labels: optional. Standard prescribes UHLn in the first four chsractsrs, but MPE doesn't care.

EOV1: End of Volume; used as first trailsr label. Rsquired if the logical fils is continued onto another reel. Identicsl to HDR1, excspt contsins the number of physical blocks of data in the data sres.

| CP | Field Name | L | Content |
|---|---|---|---|
| 1/3 | Label identifier | 3 | "EOV" |
| 4 | Label Number | 1 | "1" |
| 5/54 | Sane ae HDR1 | 50 | |
| 55/60 | Block Count | 6 | Number of dats blocke eince last beginning of File section label group. |
| 61/80 | Sane as HDR1 | 20 | |

EOV2: Defined by the etandard, but nay be nissing on foreign tapes. Follows EOV1; format sane as HDR2.

EOF1: End of File; used ae first trailsr labsl. Required if thie is the end of the logicsl file. Format sane as EOV1.

EOF2: Sane as EOV2 except used sftsr EOF1.

Ussr trailer labels: optional. Standard prescribes UTLn in the first four chsracters, but MPE agsin doesn't csre.



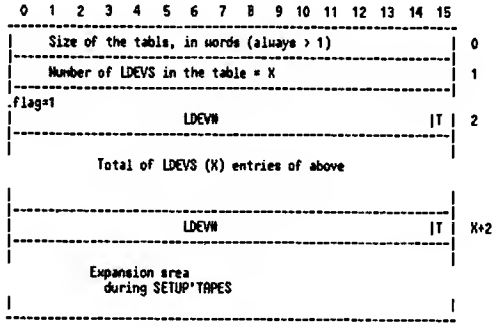


Tape Label Table

The tape label table is the privats playground of ths tape label subsysten. It coneiete of two parts: LDEV Control Blocks (LCBs) and Volume Control Blocke (VCBe). The LDEV sres ie set up at systen initislizstion and contsins one entry for sach nagnetic taps LDEV and ssrisl disc device in the systen. As ie common in MPE, the first entry is a dummy which talls where the other things in the table are. The volume sres contsins one entry for sach labeled tape volume requeeted or active on the systen.

Although table entries are etored in an extra data eegment, they are generally nanipulated via local copiss on the etack. The procedures GETLDEV and GETFNUM look for LDEV and volume sntries as epecified; they copy then to stack buffers and return the DST address for use in copying them back. POSTVTENT copise the entriss back, and in the case of a new volume sntry, allocates space for it in the volume section of the tape label table.

Initial will build the "uninitislized" TLT as follows:



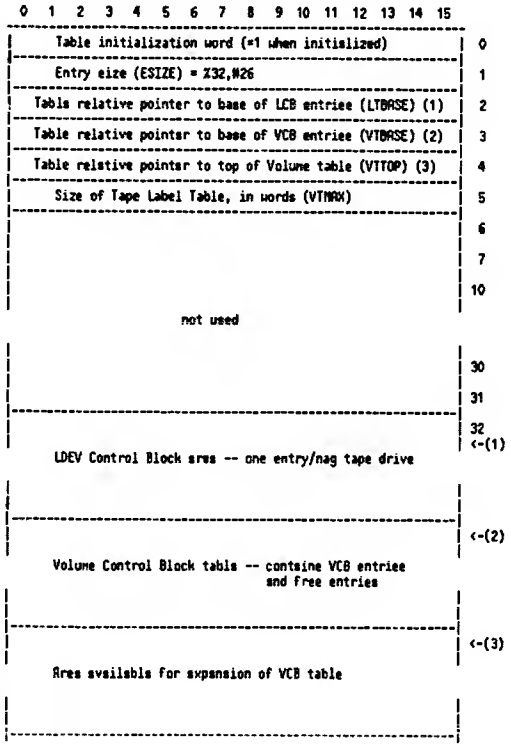

T: 1 if Tape drive 0 if not Tape drive (i.e. esrisl disc)





During PROGEN, SETUP'TAPES is called to initialize the table. The overall structure of the initislized TLT is:

TLTDST -- X32,#26 TLTSIR -- X47,#39

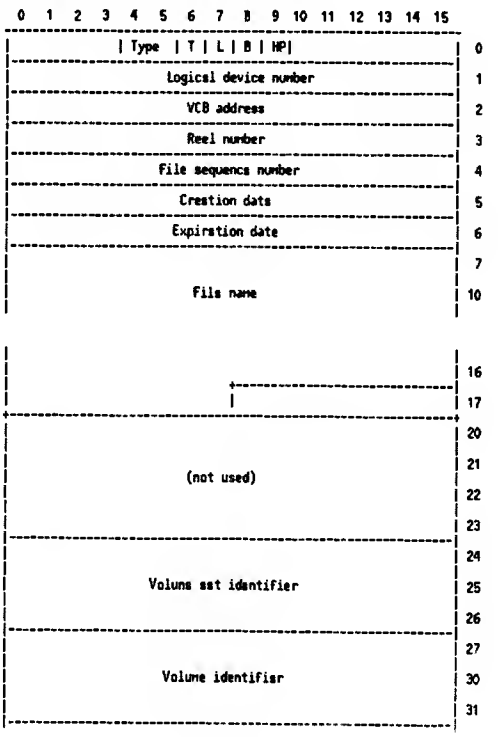







LCB Entry Format

The LCB entries have the following structure:



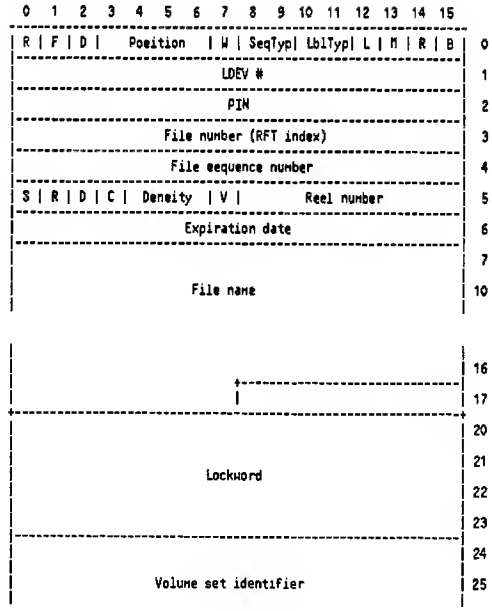
```
Type: 00 = no tape mounted
      01 = unlabelled
      10 = RNSI
      11 = IBM
L: 1 if file has lockword.
T: 1 if device is a tape drive.
B: 1 if tape ie from Burroughe, which hae incorrect block/record eize
   in the HDR2 label.  Code can be patched to correct the eize.
HP: 1 if tape ie Hewlett-Packard RNSI format.

VCB address: Pointer to VCB entry describing volume mounted on
             tape drive, only if linked.  Otherwise, 0.
```





VCB Entry Format

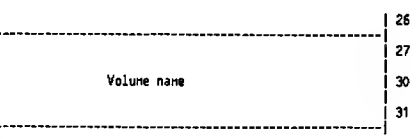
The VCB format ie:








VCB (Cont.)




```
R: RSCII FOPTION
F: Flush bit - operator did REPLY <pin>,0.
O: DEVREC Wait (used with reelswitching).
Position: Gives head position within logical file.
          0 = at load point (LDPNT)
          1 = NDR1 label next (H1NX)
          3 = after HDR2 label (RH2)
          4 = after user header labels (RNU)
          6 = data next (ONX)
          7 = after data (RO)
          8 = EOF1/EOV1 label next (T1NK)
         10 = after EOF2/EOV2 label (RT2)
         11 = after user trailer labels (RTU)
W: Write access specified.
SeqTyp: File open sequencing type.
        0 = natch filename
        1 = NEXT
        2 = RDDF
        3 = use file sequence number
LblTyp: Rs in LCB entry.
L: Linkwait - nark left by CREATETLTENT for LINKLABEL.
M: Mount wait - waiting for operator to nount tape on FOPEN.
R: Reelswitch wait - waiting for next reel.
B: Busy bit - this entry is in use.

LDEV #: Logical device number of tape drive with this volume, only if
        linked.  Otherwise, 0.

S: STORE tape.
R: REELSWITCN has been done. Used by STORE/RESTORE to handle STORE
   label and directory file.
D: Next file is directory. Used by STORE.
C: VOL1 label is to be created (written).
Oensity: volume set density.  During a volume set open, contains the
         density requested by the user in FOPEN.  Once the volume set is
         open, contains the actual density of the volume set.  Only
         valid for tapes on variable density tape drives.
         0 = default density for volume set open
         1 = 1600 BPI
         2 = 6250 BPI
V: 1 if volume set is being opened.  Reset after completion of FOPEN.
```





Volume Recognition

Volume recognition is the responsibility of DEVREC, which reads the first record of a newly-nounted tape on an unowned drive and passes the record to AVREC. AVREC nay see: VOL1 in the first 4 bytes, in RSCII, in which case the tape is RNSI; VOL1 in the first 4 bytes, in EBCOIC, in which case the tape is IBM; Rnything else, in which case the tape is considered unlabelled.

If the tape is unlabelled, AVREC reports to DEVREC that no further action ie required. If the tape is labelled, AVREC wants to see the first NDR1 label, so asks OEVREC to read another record. (Unfortunately, OEVREC cannot be stopped long enough for AVREC to do its own read.) When the HDR1 record is found, the volume entries can be searched to see if there is a pending request for this volume. If so, the waiting process is restarted.

If the systen has been restarted with tapes nounted, there will not be interrupts to alert OEVREC. The procedure RECOGNIZE is called when needed to see if any such tapes exist.

Opening a File

FOPEN gets into the tape label code in three different places. The first is to call CREATETLTENT, which parses the string passed in the FORMSMSG parameter to identify the labeled tape file required. If there is no existing corresponding entry in the volume area, this is a volume set open, and a new volume entry is created. There nay be an existing entry (if the tape was FOPENed and FCLOSEd with disposition 2 or 3), in which case there is an associated LDEV entry for the drive on which the tape was left nounted by the prior operation; in this case, the new information is stuffed into the existing volune entry. A bit (LINKWRIT) is left set to nark the entry for LINKLABEL.

The second entry is through LINKLABEL, which is called from RLLDCRTE. Rt this time, it is necessary to identify the LDEV to be used for the tape. If no LDEV is associated, the LDEV entries are searched to see if the operator has already nounted the required tape; if so, the volume and LDEV entries are cross-tied and LINKLABEL is done. If the search turns up nothing suitable, the operator is requested to nount the appropriate tape, and the procedure waits for either a REPLY or for AVREC to discover the appearance of a suitable tape and restart the process. If the operator enters a reply, it is validated.

The third entry is through POSITION, which is responsible for positioning the tape to the requested file. Rt the file, the NDR1 and NDR2 label are examined as required to determine the file characteristics.

Reading and Writing Files

All procedures which nove tape go through the catchall procedure CNECKUL, which takes care of necessary labeled tape doings. The code insures that the sequence: header labels (including user labels), data, trailer labels

(including user labsle) ie naintainsd. There ie a eeparate CASE leg for each such procsdure.

If an EOT reflsctive nark or an EOF in data is found, REELSWITCH ie called (principally fron ths fils systen procedure IOMOVE) to call for ths next reel, if any. If another resl is needsd, the tape drive ie eet Unowned so that AVREC will be callsd to recognize ths neu tape whsn it is nounted. REELSWITCH returns to its callsr when it is satisfied that an appropriate taps is nountsd.

Closing files

fCLOSE calls CHECKUL to handle uriting EOF1 and EOF2 if nesdsd and resolving the taps position. If ths disposition is 3, the tape is left positionsd at the next file. If ths disposition is 2, the tape is suppossd to be left at the beginning of ths current fils, but ths cods does not presently provide for reelsuitching if ths present fils began on a prior reel.

Rt present, snsuing volunss of a nulti-volune set nust be nountsd on the sane drive as ths first, nostly becauss nsither the file syeten nor STORE-RESTORE was capabls of dsaling uith LDEV changes in the niddls of a fils. REELSWITCN reports the LDEV being used, houevsr, so that the capability of using a dif-fsrent LDEV can bs added in ths future.

Store-Restore

Complications ensus on labeled STORE-RESTORE tapss because there nesds to be a fils directory at or near the beginning of each taps of a nulti-volune sst; RESTORE usss this directory to dstermine whether the epecified fils(s) can exist on this taps. Bscauss ths resl switching procees would otheruiss bs invisibls to STORE-RESTORE, special bits (VCB'RSWDONE and VCB'WRITOIR) are kspt to enabls spscial intrinsics callable by STORE-RESTORE to report uhether a directory nseds to be uritten or is about to bs encountsred.

Ths spscial procsdure NEXTTRPEFILE is ussd by STORE-RESTORE in lieu of doing a fCLOSE(,3) followed by an fOPEN to get to the nsxt fils. This pernits clsaner handling of both REPLY 0 and Forward Space (logical) fils over a Reelsuitch, as usll as saving the tine neadsd to tear down and reconstruct all the control blocks.

Miscellaneous

PVOLID ie ussd by the SNOWDEV connand processor (in SPDDLCOMS) to obtain the nane of ths volunn on the specifisd drivs uithout having to know the etruc-ture of ths tape labsl tabls. for the sans reason, IGETINFO ie used by the fFILEINFO intrinsic (in FILEID) to gst labsled tape information.

Systsn failure 86 in MPE is dsfinsd as a najor problsn in LABSEG. Generally speaking it ie a problsn uith ths TLT sstup, for example if LABSEG cannot find an LDEV in the tabls.





Breakpoint Table

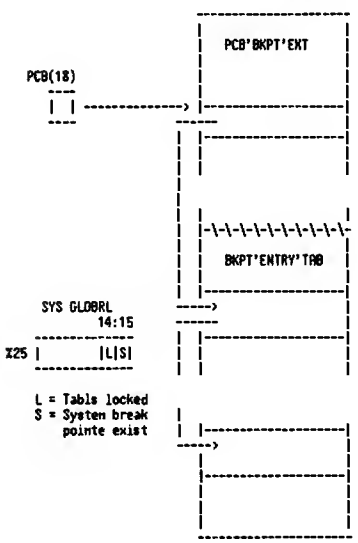
OST = 30(10) = %36

The break point tabls is divided into 2 sections:

1) PCB BREAKPOINT EXTENSION TABLE (PCB'BKPT'EXT)
   Thie tabls contains the heads of the breakpoint chains

2) BREAKPOINT ENTRY TABLE (BKPT'ENTRY'TAB)
   Thie tabls contains ths actual entries

General Layout

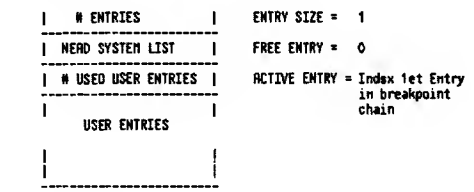



L = Tabls locked
S = Systen break pointe exist

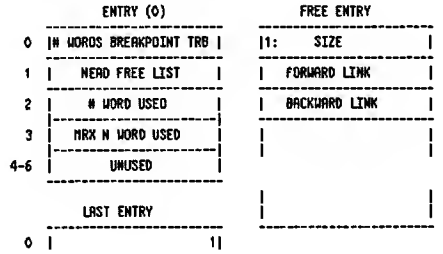




PCB Breakpoint Extension Table




Breakpoint Entry Tabls

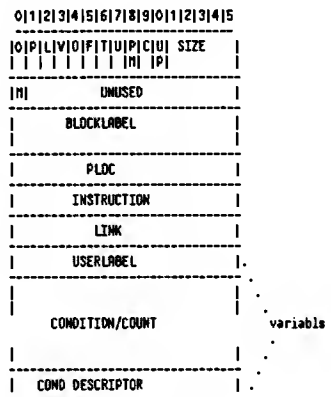



Ths breakpoint sntry tabls conelets of variable lsngth entrise
Ths ninimun entry sizs is 7.





Active Entry



```
ENTRY(0).(0:1) = FR:    FREE ENTRY
                          1 = FREE
                          0 = USED
ENTRY(0).(1:1) = P:     PRIVILEGED MODE BREAKPOINT
                          1 = PRIV.
                          0 = NON-PRIV
ENTRY(0).(2:1) = L:     PROCESS-LOCAL BREAKPOINT
                          1 = PROCESS-LOCAL
                          0 = SYSTEM
ENTRY(0).(3:1) = V:     VALIDATION BIT
                          1 = INSTRUCTION IN ENTRY(3)
                          0 = INSTRUCTION NOT IN TAB.
ENTRY(0).(4:1) = D:     DOUBLE TRAP
                          1 = BREAKPOINT OSCILLATES BETWEEN
                              P/P+1
                          0 = NOT DOUBLE TRAP
ENTRY(0).(5:1) = F:     FAKE 'DUMMY' TRAP
                          1 = BRKPOINT AT P+1
                          0 = BREAKPOINT AT P (ORIG. LOC)
ENTRY(0).(6:1) = T:     TWO WORD INSTRUCTION
                          1 = TWO WORD INSTRUCTION
                          0 = NOT TWO WORD INSTRUCTION
ENTRY(0).(7:1) = U:     USER LABEL PRESENT
                          1 = TRAP TO USER SUPPLIED LABEL
                          0 = TRAP TO DEBUG
ENTRY(0).(8:1) = PM:    PERMANENT BREAKPOINT
                          1 = PERM
                          0 = TEMPORARY
ENTRY(0).(9:1) = C:     CONDITION/COUNT
                          1 = CONDITION/COUNT SPECIFIED
                          0 = NO COND/COUNT
ENTRY(0).(10:1) = UP:   UPDATING
                          1 = ENTRY IN PROCESS OF BEING
                              UPDATED/REMOVED
                          0 = NOT BEING UPDATED/REMOVED
ENTRY(1).(0:1) = M      USER PLABEL MODE
ENTRY(6) = LINK:        LINK
                          0 = END OF CHAIN
                          >0= INDEX NEXT ENTRY
```





Breakpoint Entry Table (Cont.)

```
                COUNT                       CONDITION
            ------------------          ------------------
        1) | ORIGINRL CNT.    |      2) | OPERRNO1         |
           ------------------           ------------------
           | # OF HITS       |          | OPERRNO2         |
           ------------------           ------------------
           |              1  |          |OPT1|OPT2| RELOP  |
           ------------------           ------------------

RELOP -> (8:8) RELOP NUMBER:
                 3 = LT     9 = LTE
                 4 = GT    10 = GTE
                 5 = EQ    11 = NEQ
OPT1  -> (0:2) OPERAND1'S TYPE
OPT2  -> (2:2) OPERAND2'S TYPE

OPERAND TYPES:
   0 ->  CONSTANT (SINGLE WORD)
   1 ->  ADDRESS (DOUBLE WORD)
   3 ->  INDIRECT ADDRESS (TRIPLE WORD)

OPERAND FORMS:
   CONSTANT ->  -------------
                | CONST     |
                -------------

   ADDRESS  ->  -------------
                | REG | BASE|
                -------------
                | OFFSET    |
                -------------
                |IND. OFFSET|   (TYPE 3 ONLY)
                -------------

   REG      ->  (0:6) CORRESPONDING INDEX INTO 'REGY':
                       3 = R     10 = DL
                       4 = SY    11 = Q
                       7 = DA    12 = S
                       8 = DX    17 = ER
                       9 = DB
   BASE     ->  (6:10) SEG #/BANK #
```





Timer Request List (TRL)

The system clock interrupts every 100 ms, with the CR being automatically cleared. An exception is the Shared Clock Interface measurement service which allows rates as fast as 5 ms. The interrupt handler is the procedure TICK. On entry, OB is pointing to the base of timer request list. Besides timeout requests, the clock also controls time slicing.

```
      ------------------------------|
    / 0|       NUMBER OF ENTRIES     |
    | |-----------------------------|
    | 1|       ENTRY SIZE (4)       |
ENT0| |-----------------------------|
    | 2|       FREE LIST PTR        |
    | |-----------------------------|
    \ 3|  # of days since last start | NP-IB Systems only
      |-----------------------------|
    / 4|       QUANTUM/100 ms       | QTIME
    | |-----------------------------|
    | 5|                            |
    | |         TIME OF DAY*       | QTIME*
ENT1| 6|                            |
    | |-----------------------------|
    \ 7|    YEAR     | JULIAN DAY   |
      |-----------------------------|
    / 8| PTR TO MOST ACTIVE REQUEST  | NERQ
    | |-----------------------------|
    | 9|         TRACE WORD         |
ENT2| |-----------------------------|
    |10|             0              |
    | |                            | dummy time
    \11|             0              | ----------
      |-----------------------------|      |
    /12|R|  CODE  | INDEX OF NEXT   |      |
    | |-----------------------------|      |
    |13|            REQ             |      |
ENT3| |-----------------------------| assignable
    | |    TIME TO SERVICE AFTER    | entries
    \ | REQUEST IN FRONT (UNIT= 100ms)|    |
      |-----------------------------|      |
      |                             |      |
      |                             |      |
      |                             |      |
   R:  0 if inactive request                ----------
       1 if active request
```





TRL (Cont.)

CODE & REQ indicate the type of request.

| CODE: | REQ: | TYPE: |
|---|---|---|
| 0 | OITP | Hangup |
| 1 | OITP | Carrier failure |
| 2 | OITP | 202 turnaround |
| 3 | OITP | Read |
| 4 | OITP | Logon |
| 5 | PCBB index to process | Delay |
| 6 | OITP | LP not ready |
| 7 | OITP | 2640 |
| X10 | Port mask | Msg port timeout |
| X11 | OITP | Block mode read timeout (30 secs) |
| X12 | PCBB index to process | Watchdog timer for process |

The list of pending requests is kept ordered by time with later entries at the tail.

| | | |
|---|---|---|
| X20-X37 | OITP | SIO device timeout: OIT8. (code_1 on expiration, cleared on Timereq. |
| X5/X6 | *DTIME | For Series 30/33, DTIME is # of TICS (0.091457 ms) since last midnight. |

## MPE User Logging

MPE USER LOGGING enables users and subsystems to log changes to data sets on disc or serial files. This "change" file can later be used to recover data lost due to a system or program failure. The log file can itself be used for auditing purposes.

## General Design Overview

### Hardware Environment

No special hardware is required to operate the system. However, if logging to a tape file is desired, the hardware configuration must include a tape drive. If there is no tape drive, then may log to a serial disc class device.

### Software Environment

MPE User Logging is an integral part of MPE. No other special software is required.

### Design Narrative

User Logging enables users and subsystems to journalize additions and modifications to MPE and subsystem files. The journal can reside on either disc or serial logfiles.

User Logging consists of a logging process, a memory buffer, a disc resident logging buffer (for serial logging) and a user defined destination log file on disc or serial media.

The logging process has two functions depending on whether the destination file resides on disc or serial media. If the destination file is serial, the logging process performs all output to the destination file. If the destination file is on disc, the logging process allocates additional space (extents) as it is required by the user.

The logging buffer is divided into communication and buffer areas. The communication area is used to pass information among the users and the logging process. This information includes status of the logging process and logging file, space remaining in the logging file and error information important to users or the logging process. The buffer portion of the logging data segment blocks inputs into the logging file before the data is actually posted. The buffer is flushed any time a user requests to close a log file or when a logging process is terminated. (The buffer is also flushed by the begin/end transaction or buffer flush requests).





### Error Recovery Description

The error recovery mechanisms provided by User Logging are: power fail recovery and recovery from system failure.

Power failure recovery applies only to tape log files since MPE provides adequate recovery for disc files during power fail. When a power failure is detected, a message will be printed on the console asking the operator to place the tape drive back on-line. (If the operator places the tape on-line before the message valid data may be overwritten). (To reset the tape drive the operator must hit the load button until the tension returns to the drive. Then hit the reset button followed by placing the tape drive back on-line). At this time the log process will recover the file by rewinding to the load point and then forward spacing to the point where the power fail occurred. Writing to the log file will continue at that point.

In the event of a system failure, the warm start load option initiates recovery of User Logging files. In the case of a serial file, the file is read and compared to the disc logging buffer. All records found in the disc buffer that are not on the serial log file are posted and a proper end of file written. If the destination file is a disc file, all records are read and varified and an end of file posted to the file. In order to continue logging to a User Logging file that has been recovered in this manner, the logging process for the file must be restarted using the console command :LOG.

NOTE:

Any records in the buffer area of the logging buffer will be lost.

User logging has been enhanced to work with labeled serial discs. Internally the log process handles serial disc (or cartridge tape) log files the same as for tape files.





## Design Structures

### User Logging Table

ENTRY SIZE = #38 words
DST X33

Table containing an entry for each activated user logging process. Each entry is created when the process is started, and deleted when the process terminates. (Via :LOG command). The information is extracted from the Logging Identifier Table (LIDTAB).

ENTRY 0

| # | | % |
|---|---|---|
| 0 | NUMBER OF ENTRIES | 0 |
| 1 | FREE ENTRY HEAD PT. | 1 |
| 2 | INUSE ENTRY HEAD PT. | 2 |
| 3 | NEXT BUFFER NUMBER | 3 |
| 4 | MAX # PROCESSES | 4 |
| 5 | MAX # USERS/PROCESS | 5 |
| 6 | | 6 |
| 7 | ENTRY SIZE | 7 |
| | . | |
| | . | |
| 37 | . | 45 |

WORD ENTRIES

| | | |
|---|---|---|
| NUMENTRIES | = | LOGTAB |
| FREE | = | LOGTAB(1) |
| INUSE | = | LOGTAB(2) |
| BUFNUM | = | LOGTAB(3) |
| MAXLOGPROC | = | LOGTAB(4) |
| MAX'USR'PROC | = | LOGTAB(5) |
| LOGTAB'ESIZE | = | LOGTAB(7) |





NUMENTRIES
The number of entries in the logging table.

FREE
A table relative pointer to the first free entry in the logging table. (-1 = table full).

INUSE
A table relative pointer to the first entry in the logging table that is being used (-1 = no entries in use).

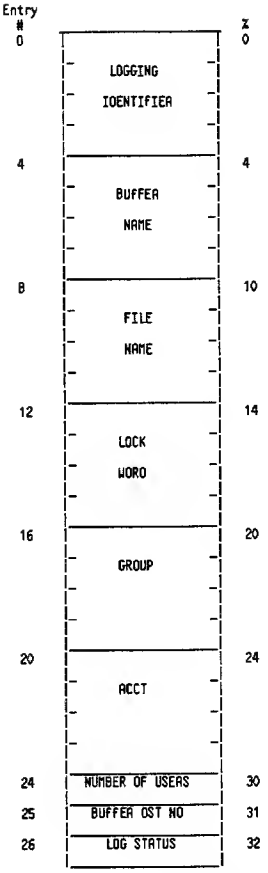
BUFNUM
The number of the buffer associated with this logging process. Used to create the name of buffer file if serial logfile. (i.e. ULOGxxxx.PUB.SYS).

MAXLOGPROC
The maximum number of user logging processes allowed.

MAX'USR'PROC
The maximum number of users per logging process.

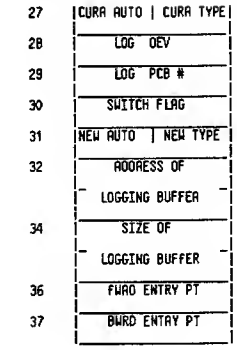
LOGTAB'ESIZE
The size (in words) of each entry in the table.

Typical Entry








```
TABINDEX    =   WORD INDEX TO CURRENT ENTRY
BTABINDEX   =   BYTE INDEX TO CURRENT ENTRY
DTABINDEX   =   DOUBLE INDEX TO CURRENT ENTRY

LGNAME      =   BTABINDEX
BNAME       =   BTABINDEX+8
LFNAME      =   BTABINDEX+16
LFLOCKW     =   BTABINDEX+24
LFGROUP     =   BTABINDEX+32
LFACCT      =   BTABINDEX+40

NUMUSERS    =   TABINDEX+24
DST         =   TABINDEX+25
STATUS      =   TABINDEX+26
LGAUTO      =   TABINDEX+27.(0:8)
LGTYPE      =   TABINDEX+27.(8:8)
LGDEV       =   TABINDEX+28
PIN         =   TABINDEX+29
LGSWITCH    =   TABINDEX+30
LGNEWAUTO   =   TABINDEX+31.(0:8)
LGNEWTYPE   =   TABINDEX+31.(8:8)
LGADDR      =   DTABINDEX+16
BSIZE       =   DTABINDEX+17
NEXT        =   TABINDEX+36
PREV        =   TABINDEX+37
```





LGNAME
The name of the logging process (logging identifier).

BNAME
The name of the disc buffer used if the logging process destination file is a serial file. This is a file that resides in PUB.SYS. The format of the name is ULOGxxxx where xxxx is the buffer number padded on the left with zeros.

If the switch flag is true, the following will be the fully qualified file name of the new log file.

LFNAME
The name of the logging file.

LFLOCKW
The lockword of the disc logging file.

LFGROUP
The group that the destination logging file resides in if the file is a disc file.

LFACCT
The account that the destination logging file resides in if the file is a disc file.

NUMUSERS
The number of users currently accessing the logging file.

DST
The dst number of the logging data segment (LOGBUFF). (-1 = LOGBUFF not created yet)

STATUS
The status of the logging process.

| | |
|---|---|
| INITIALIZING | = -1 |
| INACT | = 0 |
| ACT | = 1 |
| RECOVERING | = 2 |

LGAUTO
True if the automatic changelog facility was enabled. (Not used - for future use).

LGTYPE
The type of destination file of the logging process.

| | |
|---|---|
| DISC | = 0 |
| TAPE | = 1 |
| SDISC | = 2 |
| CTAPE | = 3 |

LGDEV
The logical device number of the disc logging file or the disc logging buffer.

PIN





The PCB number for the logging process (PIN * PCBSIZE).

LGSWITCH
Flag indicating a CHANGELOG is pending (if true). (Not used - for future use).

LGNEWAUTO
True if the automatic changelog facility was requested for the new log file. (Not used - for future use).

LGNEWTYPE
If a switch is pending, this will be the type of the new log process. (-1 = no switch pending). (Not used - for future use).

LGADDR
Sector number of the current extent in the disc logging file or the disc buffer file. (Disc buffer file has only 1 extent)

BSIZE
The number of records in the current extent (for disc logging) or the number available in the disc logging buffer.

NEXT
A table relative pointer to the next entry in the logging table. (-1 = this is last entry)

PREV
A table relative pointer to the previous entry in the logging table. (-1 = this is first entry)

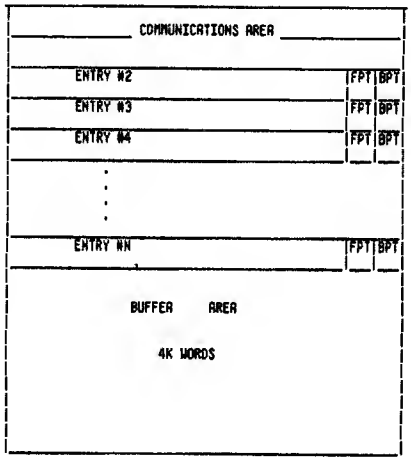
## User Logging Buffer

There will be one of these tables around for the life of any active user logging process. The table consists of three parts:

COMMUNICATIONS AREA - Information about status of the process, etc. that is common to all users of the process. Also the cells for messages to/From the process.

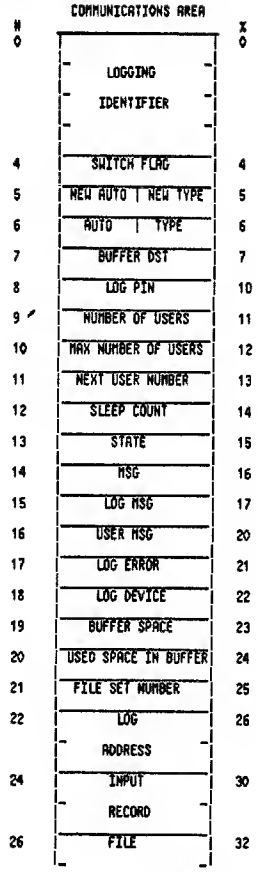
USER ENTRIES - Information for a specific user of the process. One of these for every user of a process (Setup by OPENLOG, released by CLOSELOG).

BUFFER AREA - Buffer used to hold logging records from all users before writing to the log File.



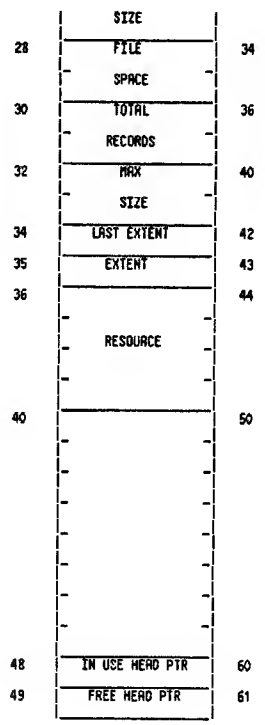













```
LOGID      =   BLOGBUFF(0)

SWITCH'    =   LOGBUFF(4)
NEWAUTO    =   LOGBUFF(5).(0:8)
NEWTYPE    =   LOGBUFF(5).(8:8)
AUTO       =   LOGBUFF(6).(0:8)
LOGTYPE    =   LOGBUFF(6).(8:8)
BDST       =   LOGBUFF(7)
LOGPIN     =   LOGBUFF(8)
NUMUSER    =   LOGBUFF(9)
MAXUSER'   =   LOGBUFF(10)
USERNO     =   LOGBUFF(11)
SLPCT      =   LOGBUFF(12)
STATE      =   LOGBUFF(13)
MSG        =   LOGBUFF(14)
LOGMSG     =   LOGBUFF(15)
USERMSG    =   LOGBUFF(16)
LOGERR     =   LOGBUFF(17)
LOGDEV     =   LOGBUFF(18)
BSPACE     =   LOGBUFF(19)
BUFUSED    =   LOGBUFF(20)
VSETNO     =   LOGBUFF(21)

LOGADDR    =   DLOGBUFF(11)
INBUFREC   =   DLOGBUFF(12)
FSIZE      =   DLOGBUFF(13)
FSPACE'    =   DLOGBUFF(14)
TRECS      =   DLOGBUFF(15)
MAXFSPACE  =   DLOGBUFF(16)

LASTEXT'   =   LOGBUFF(34)
EXTENT     =   LOGBUFF(35)

RESOURCE   =   DLOGBUFF(18)

UHEAD      =   LOGBUFF(48)
FHEAD      =   LOGBUFF(49)
```

LOGID
The name of the logging process.

SWITCH'
True if log file switch is pending. (Not used - for future use).

NEWRUTO
True if the automatic changelog option has been specified for the new log file. (Not used - for future use).

NEWTYPE
If a switch was requested, this will be the type of the new logging file. (-1 = no switch pending) (Not used - for future use).

AUTO
True if the automatic changelog option was specified for the current log file. (Not used - for future use).

LOGTYPE
The type of destination file for the logging process.
DISC = 0
TAPE = 1
SOISC = 2
CTAPE = 3

BOST
The data segment number of this table.

LOGPIN
This is the PCB number for the logging process (PIN*PCBSIZE).

NUMUSER
The number of users currently accessing the logging file.

MAXUSER'
The maximum number of users allowed to access the logging file.

USERNO
The next sequential number to be assigned users accessing the system. It will get incremented for every unique OPENLOG - used as the log # in the logging record format.

SLPCT
The number of users currently waiting for activation by the logging process.

STATE
The state of the user logging process.
INACTIVE = 0
ACTIVE = 1

MSG
An internal message word used to indicate an error or operator request.
6 - Continue processing, all is fine.
2 - Suspend - error reading buffer file or writing to serial file
3 - Stop - set when issue :LOG logid,STOP or when an EOF condition is found on the disc log file.





LOGMSG
A messages from the logging process.
6 - Continue processing, all is fine.
15 - EOF - if there are no more extents available to be allocated.
12 - Disc space - could not allocate the new extent because no space left in the group.
9 - Write error - error occurred while writing to log file

USERMSG
A messages from the user process.
6 - Continue processing, all is fine.
12 - Disc space - user process needs another extent allocated for disc logging.

LOGERR
Last error found. After changelog:
+N - File System error number encountered
0 - No error
-1 - New disc log file was not empty
-2 - New disc log file did not have file code LOG
-3 - New disc file is too small
(Not used - for future use).

LOGDEV
The logical device number of the current extent of the disc log file or the disc buffer file (buffer file has only 1 extent).

BSPACE
The amount of space, in records, that are currently available to the users. On the last block of the last extent, one record will be saved by the logging process so that the proper close information can be posted to the file - either the trailer record (if the log logging process is stopped) or the change'to'new record because of an EOF condition (and the AUTO option had been specified).

BUFUSED
The number of records currently in the buffer. On all extents, except the last extent BUFSPACE+BUFUSED = 32 (number of records in a complete block). However, on the last block of the last extent this will NOT be true since one record is always held in reserve by the logging process.

VSETNO
This shows the order in the log file "set" of the currently opened log file. (Not used - for future use).

LOGADDR
The disc address of the current extent of the disc log file. If it's a serial file, this is the disc address of the disc buffer for the file.

INBUFREC
The record number of the next block to be written to the logging destination file or the disc logging buffer for serial files. (Used as an offset into the current extent for the writes - since each record is one sector in length).





FSIZE
The current extent size of the logging destination file or disc logging buffer file for serial destination files. (on the last extent this will be the last extent size minus 1).

FSPACE'
The space in records that remains in the current extent of the disc logging destination file or disc buffer for tape destination files. (On the last extent of the disc log file, this is the amount of space minus 1).

TRECS
The total number of records written to the logging destination file (including those records currently in the buffer).

MAXFSPACE
The total file size, in records, minus 1. (Need that last record to post close information).

LASTEXT'
The extent number of the final extent in the disc logging file or disc buffer file.

EXTENT
The current extent number of the disc logging file or disc logging buffer.

RESOURCE
Used for resource management (i.e. locking the LOGBUFF). Format is:
RESOURCE + 0 = Owner PCB number
RESOURCE + 1 = Head of impeded queue PCB number
RESOURCE + 2 = Tail of impeded queue PCB number
RESOURCE + 3 = Queue length

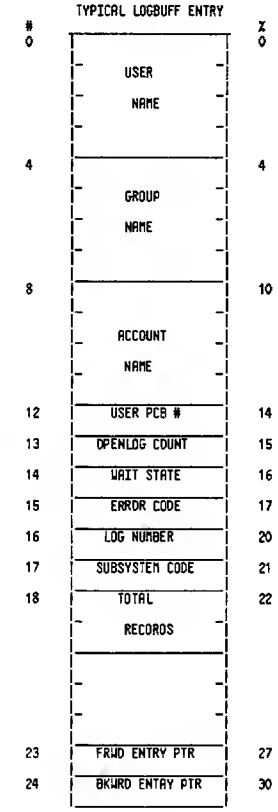
UHEAD
A table relative pointer to the first entry into the logging data segment. (-1 = no entries currently in use)

FHEAD
A table relative pointer to the first free entry in the logging data segment. (-1 = no free entries)





TYPICAL LOGBUFF ENTRY



```
BINDEX    =   BYTE INDEX TO CURRENT ENTRY
INDEX     =   WORD INDEX TO CURRENT ENTRY
DINDEX    =   DOUBLE INDEX TO CURRENT ENTRY

USER      =   BINDEX
GROUP     =   BINDEX+8
ACCT      =   BINDEX+16

UPIN      =   INDEX+12
OPENCNT   =   INDEX+13
USTATE    =   INDEX+14
ERROR     =   INDEX+15
LGNUM     =   INDEX+16
SCODE     =   INDEX+17

RECS      =   DINDEX+9

NENTRY    =   INDEX+23
PENTRY    =   INDEX+24
```

USER
The name of the user who opened the logging file through this entry.

GROUP
The group of the user who opened the logging file.

ACCT
The account of the user who opened the logging file.

UPIN
The PCB number of the user process (PIN * PCBSIZE).

OPENCNT
Counter of how many times this user called OPENLOG. (Incremented for every OPENLOG, decremented for every CLOSELOG). (Not used - for future use).

USTATE
The wait status of the users process.
INACTIVE = 0
ACTIVE = 1

ERROR
Used to hold error information for this user.
-1 = No room in disc (or disc buffer) and NOWAIT.
0 = O.K.

LGNUM
The logging number assigned to the user. (From USERNO in global area to be used as log # in the log record).

SCODE
The subsystem code for the caller. This applies only to privileged callers.

RECS
The number of records written by this user.





NENTRY
A table relative pointer to the next entry in the logging data segment. (-1 = this is the last entry)

PENTRY
A table relative pointer to the previous entry in the logging data segment. (-1 = this is the first entry)



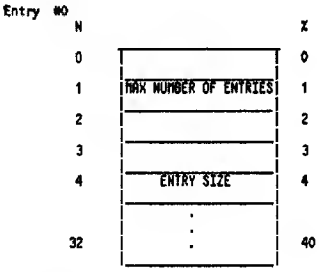


User Logging Identifier Table

ENTRY SIZE = #33 words
OST %41

Table containing an entry for each potential logging process. Entries are added via :GETLOG and released via :RELLOG.

Entry #0




ENTRIES

```
MENTRIES     =   LIOTAB(1)
ENTRYSIZE    =   LIOTAB(4)
```

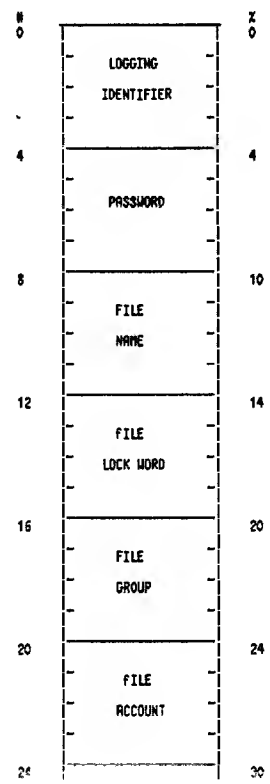
MENTRIES
The maximum number of entries in the table. (i.e. maximum number of user logging processes. 1 entry for every process - activated or not).

ENTRYSIZE
The size of each entry in the table.

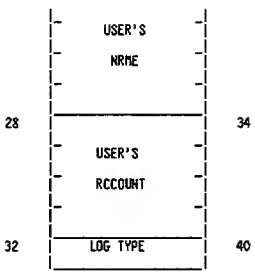




Typical Entry



Typical Entry (Cont.)




BYTE ENTRIES

| | | |
|---|---|---|
| LIO | = | BLIOTRB |
| PW | = | BLIOTRB(8) |
| FNAME' | = | BLIOTRB(16) |
| LW | = | BLIOTRB(24) |
| FGROUP | = | BLIOTRB(32) |
| FACCT | = | BLIOTRB(40) |
| UNAME | = | BLIOTRB(48) |
| UACCT | = | BLIOTRB(56) |

WORD ENTRIES

| | | |
|---|---|---|
| TYP | = | LIOTRB(32) |

LIO
The logging identifier name. This is a maximum of eight characters long.

PW
The pass word for the logging identifier. This is a maximum of eight characters long.

The following is the fully qualified file name of the current log file.

FNAME'
The name of the destination file.

LW
The lock word on the destination file if the file is on disc.

FGROUP





The group that the file resides in.

FACCT
The account that the destination file resides in.

UNAME
The name of the user who created the logging identifier.

UACCT
The account of the user who created the logging identifier.

TYP
The status of the entry. -1 = null entry
0 = disc logging file
1 = tape logging file
2 = serial disc logging file
3 = cartridge tape logging file

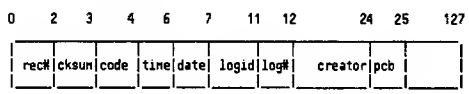




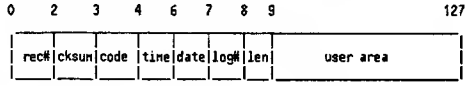
Logging Record Format

RECORD SIZE = 128 words
USER AREA = 119 words

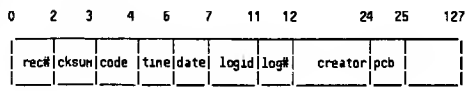
LOG RECORD AT OPENLOG



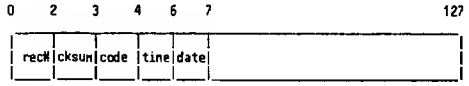

USER OR SUBSYSTEM/CONTINUATION LOG RECORD (from WRITELOG)



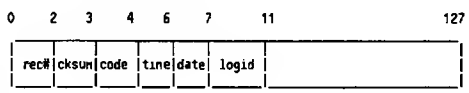

LOG RECORD AT CLOSELOG




CRASH MARKER



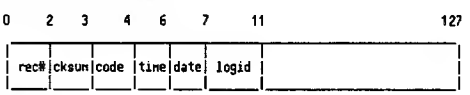

HEADER RECORD (STRRT/RESTRRT)



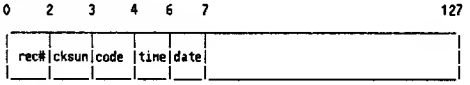




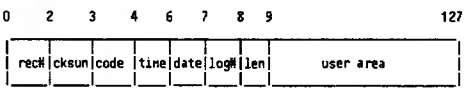

TRAILER RECORD (STOP)



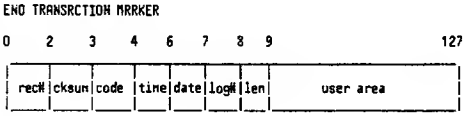

NULL RECORD




BEGIN TRANSACTION MARKER




END TRANSACTION MARKER




CODE DEFINITION

CODE.(8:8) =

| | |
|---|---|
| 1 | Open log record |
| 2 | User/subsystem record (writelog) |
| 3 | Close log record |
| 4 | Header record |
| 5 | Trailer record |
| 6 | Restart record |
| 7 | Continuation of a user or subsystem record |
| 9 | Crash marker |
| 10 | End transaction record |
| 11 | Begin transaction record |
| SPACE | NULL record |

DATA FIELDS OF LOG RECORDS

```
RECN      =     DOUBLE INTEGER
CKSUM     =     INTEGER
CODE      =     INTEGER
TIME      =     DOUBLE  (from intrinsic CLOCK)
DATE      =     INTEGER (from intrinsic CALENDAR)
LOGID     =     ASCII
LOGN      =     INTEGER
LEN       =     INTEGER
USERAREA  =     ASCII
CREATOR   =     ASCII
PCB       =     INTEGER
```

NOTE:

1. The checksum algorithm uses the exclusive or (XOR) function against a base of negative one.

2. Null record is used for filler.

3. The code word of the logging record can contain a subsystem code defined by the user in the first half of the word (0:8). User logging allows privileged users to pass this code in the index parameter of the Openlog intrinsic.

4. The "len" field will contain the entire length of the data in the transaction (i.e. the length passed to WRITELOG, BEGINLOG, ENDLOG). If a continuation record is part of the transaction, it will also contain the entire length of the data. For example, a length of 140 was passed to the intrinsic. The "len" field of the first record will be 140, the "len" field of its continuation record will also be 140 - even though the actual amount of data found in the first record will be 119 and the data found in the continuation record will be 21.
(Positive length = N words, negative length = N bytes)





MEASINFOTAB  DST = 59 (% 73)

| | | | |
|---|---|---|---|
| | 0 | LDEV # OF MEASIO | MEASLDEV |
| | 1 | MEASIO PLABEL | MEASPLAB |
| | 2 | MEASIO DST # | MEASDSTN |
| Reserved for MEASID control | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |
| | 7 | | |
| | 10 | | |
| | 11 | | |
| | 12 | | |
| Reserved for performance tuning parameters | 13 | | |
| | 14 | | |
| | 15 | | |
| | 16 | | |
| | 17 | | |
| | 20 | GLOBAL STATISTICS XDS NUMBER | MEASSTATX-DSNUM |
| | 21 | PROCESS STATISTICS XDS BANK | MEASPROC-XDSBANK |
| | 22 | PROCESS STATISTICS XDS BASE | MEASPROC-XDSBASE |
| | 23 | PROCESS STATISTICS XDS NUMBER | MEASPROC-XDSNUM |
| | 24 | CLASS 14 STATISTICS XDS BANK | |
| | 25 | CLASS 14 STATISTICS XDS BASE | |





MEASINFOTAB (Cont.)

| | | |
|---|---|---|
| | 26 | CLASS 14 STATISTICS XDS NUM. |
| | 27 | CLASS 13 STATISTICS XDS BANK |
| | 30 | CLASS 13 STATISTICS XDS BASE |
| | 31 | CLASS 13 STATISTICS XDS NUM. |
| | 32 | CLASS 12 STATISTICS XDS BANK |
| | 33 | CLASS 12 STATISTICS XDS BASE |
| | 34 | CLASS 12 STATISTICS XDS NUM. |
| | 35 | CLASS 11 STATISTICS XDS BANK |
| | 36 | CLASS 11 STATISTICS XDS BASE |
| | 37 | CLASS 11 STATISTICS XDS NUM. |
| | 40 | CLASS 10 STATISTICS XDS BANK |
| | 41 | CLASS 10 STATISTICS XDS BASE |
| | 42 | CLASS 10 STATISTICS XDS NUM. |
| | 43 | CLASS 09 STATISTICS XDS BANK |
| | 44 | CLASS 09 STATISTICS XDS BASE |
| | 45 | CLASS 09 STATISTICS XDS NUM. |





MEASINFOTAB (Cont.)

| | | | |
|---|---|---|---|
| reserved for measurement interface | . | | |
| | . | | |
| | 50 | CLASS 0 ENABLED COUNT | CLASS 1 ENABLED COUNT |
| | 51 | CLASS 2 EN.CNT. | CLASS 3 EN.CNT. |
| | 52 | CLASS 4 EN.CNT. | CLASS 5 EN.CNT. |
| | 53 | CLASS 6 EN.CNT. | CLASS 7 EN.CNT. |
| | 54 | CLASS 8 EN.CNT. | CLASS 9 EN.CNT. |
| | 65 | CLASS 10 EN.CNT. | CLASS 11 EN.CNT. |
| | 56 | CLASS 12 EN.CNT. | CLASS 13 EN.CNT. |
| | 57 | CLASS 14 EN.CNT. | CLASS 15 EN.CNT. |
| | 60 | | |
| | 61 | | |
| reserved for shared clock interface user | 62 | | |
| | 63 | | |
| | 64 | | |
| | 65 | | |
| | 66 | | |
| | 67 | | |

MEASINFDTAB (Cont.)

| | | | | |
|---|---|---|---|---|
| | 70 | M | FLAG | A |
| shared | 71 | | XDSI | |
| clock | 72 | | XDS2 | |
| interface | 73 | | DCOUNT | |
| cells | 74 | | DLIMIT | |
| | 75 | | TCOUNT | |
| | 76 | | TLIMIT | |
| | 77 | | DLABEL | |
| | 100 | | MONITOR BUFFER INDEX | SMONIDX |
| | 101 | | MEAS BUFFER | MEASBUF0 |
| | 102 | | MEAS BUFFER INDEX | MEASIDX |
| reserved | 103 | | MEAS ENABLED FLAGS | MEASMSK0 |
| for event | 104 | | MEAS ENABLED FLAGS | MEASMSK1 |
| logging | 105 | | MEAS BUFFER BANK | MEASBUFBANK |
| | 106 | | | |
| | . | | | |
| | . | | | |
| | 116 | | | |
| | 117 | | | |

M: Interrupt has missed due to last interrupt handling.

A: Current interrupt handling active.

# CHAPTER 18 MESSAGE FILES

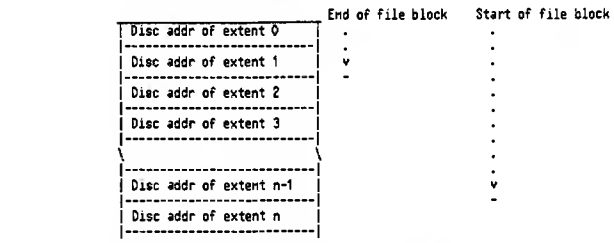
## Message File Data Structures

This chapter contains the data structures necessary to support message files. The first section details the message file's version of the familiar file system data structure; ie, the file label, file control block, access control block, etc..

The second section shows the tables used by the basic IPC mechanism which is a set of internal, MPE procedures designed to support the "boundary conditions" of IPC files. For example, signaling a no wait reader that its record has arrived. See the section's introduction for a detailed description.

### File Structure

File Label/FCB Extent Map




The EOF and SOF are examples only, meant to show:

1) The start of file moves into the extent map as records are read
2) The file can wrap around and, hence, cause the SOF to be greater than the EOF.

When a file becomes empty the SOF and EOF are reset to the first block of extent zero.

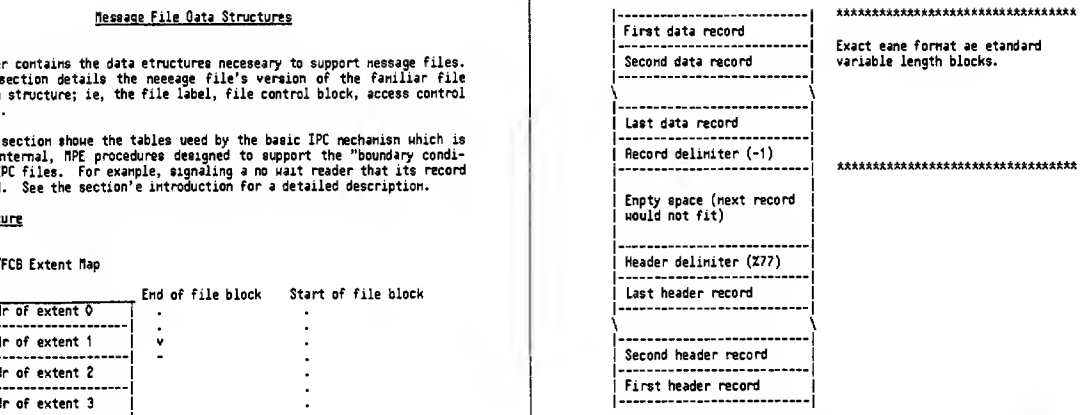
Each extent is composed of a number of blocks. Extents all have the same number of blocks. Extent zero also contains space for the file label and user labels in the exact same format as standard files. Starting with block zero, sufficient blocks are allocated to the file label/user labels to satisfy their space requirements.

Extents outside of the SOF/EOF range may not exist. They are deleted at close time when there are no more writers accessing the file.



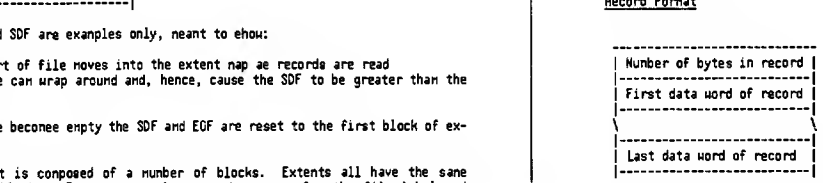


### Block Structure




Separating the data portion of the records from their header enables the standard file system access procedures to read the records with no knowledge that they are msg file records.

### Record Format




Length word's value does not include itself.





### Header Format


C (0:1) - Set on if this was the last record written before the system crashed. This bit is set on by the first open on the file after the crash.

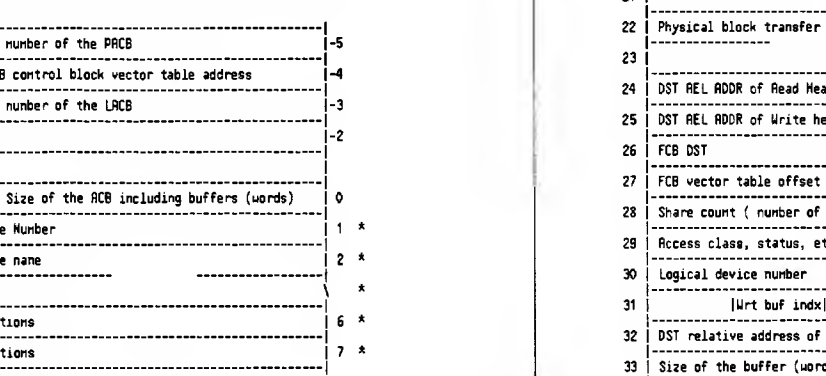
LC (1:1)- Valid only for close headers. Set to one if this is the last writer to close the file.

Type(8:8)- 0 data
1 open
2 close

### Message Access Control Block

Notes:
1. Words/fields that do not pertain to message files are left blank.

2. This diagram shows the "combined" ACB as it appears to the message access procedures (the procedures in IPC). Thus it is a combination of the LACB and the PACB.








### Message Access Control Block (Cont.)

Message Access Control Block (Cont.)

| | | |
|---|---|---|
| 34 | Spare | 42 |
| 35 | FMAVT index | 43 |
| 36 | Number of read LACBs | 44 |
| 37 | Type and disposition | 45 |
| 38 | Access mask \| Records per block | 46 |
| 39 | 0 \| # rd buf \| # wt buf \| er \| qw \| n \| c \| d \| e \| f | 47 |
| 40 | Misc. msg fils flags | 50 |
| 41 | Number of free word in the current free record | 51 |
| 42 | Number of free records | 52 |
| 43 | | 53 |
| 44 | Number of nondata records in the file | 54 |
| 45 | | 55 |
| 46 | Spare | 56 |
| 47 | #open records \| # read requests | 57 |
| 48 | last read error \| last write error | 60 |
| 49 | DST relative address of the next write record | 61 |
| 50 | Spare | 62 |
| 51 | Spare | 63 |
| 52 | DST rel address of the PACB | 64 |
| 53 | DST rel address of the LACB | 65 |
| 54 | DST relative address of the stack ACB | 66 |
| 55 | Stack DST relative address of DB | 67 |
| 56 | Target area's DST number | 70 |
| 57 | Reserved for calling parameters | 71 |
| 58 | | 72 |
| 59 | | 73 |





Message Access Control Block (Cont.)

| | | |
|---|---|---|
| 60 | Reserved for the stack marker from file system | 74 |
| 61 | Intrinsics | 75 |
| | \ | \ |
| 64 | User's soft interrupt plabel | 100* |
| 65 | Number of seconds to wait on boundary condition | 101* |
| 66 | D\|Ex\|Nd\|Vr\|Bt\|Cle \|C \| Carriage control | 102* |
| 67 | Reply Port (basic IPC port) | 103* |
| 68 | Writer ID | 104* |
| 69 | Control block index for nowait writer record buf | 105* |
| 70 | DST relative addr of nowait writer record buffer | 106* |
| 71 | | 107* |
| 72 | No wait I/O resultant error code | 110* |
| 73 | No wait I/O resultant transmission log | 111 |
| 74 | write wait queue (basic IPC port) | 112 |
| 75 | Read wait queue (basic IPC port) | 113 |
| 76 | Length of record in bytes | 114 |
| 77 | Head record's record type (same values as header) | 115 |





Message Access Control Block (Cont.)

| | | |
|---|---|---|
| 78 | Head record's writer ID | 116 |
| 79 | Misc. flags \| Record type | 117 |
| 80 | Size of record + count + header words | 120 |
| 81 | Completor ID \| Waiter ID | 121 |
| 82 | Local flags | 122 |
| 83 | Target DST number | 123 |
| 84 | DST relative address of target area | 124 |
| 85 | Length of target area | 125 |
| 86 | Waiter's reply port, 0 if using ACB compltn area | 126 |
| 87 | Waiting process's PIN | 127 |
| 88 | Waiting process's pin | 130 |
| 89 | Waiter's soft interrupt plabel | 131 |
| 90 | Resultant error code | 132 |
| 91 | Resultant transmission log | 133 |
| 92 | DST rel address of first buffer | 134 |
| | DST rel address of buffer two | |

.
.
.

* Value is private to a particular accessor.





| Word | Field | Description |
|---|---|---|
| 66 | | Accessor's local flags. |
| | (0:1) D | 1 - have not yet issued an FREAD/FWRITE against the file. |
| | (1:1) ex | 1 - extended wait mode. |
| | (2:1) nd | 1 - do not destroy the next record read. |
| | (3:1) vr | 1 - writer has not yet written his first record (ie., he is a virgin). |
| | (4:1) bt | 0 - transmission log should be expressed in words. 1 - " " " " " " bytes. |
| | (5:1) cle | - Not currently used (reserved for group IPC standard). |
| | (6:1) C | - No wait completion message is in LACB area. |
| | (8:8) car ctl | - carriage control character to be used for the writer's record (a value of one indicates no carriage control character). |
| 40 | | File's global flags. |
| | (1:4) | - number of read buffers |
| | (5:4) | - number of write buffers |
| | (9:1) er | 1 - extended read |
| | (10:1) qw | 1 - one or more writers has been queued on the wait queue. |
| | (11:1) n | 1 - wait msg is located in the ACB |
| | (12:1) c | 1 - completion msg is located in the ACB |
| | (13:1) d | 1 - the current write buffer has dirty bit set |
| | (14:1) e | 1 - the start of file is block zero |
| | (15:1) f | 0 - the ACB buffers have not been filled |

MMSTAT Definitions

| Octal Value | Event Type | Parameter 1 | Parameter 2 |
|---|---|---|---|
| 72/0 | Read init | # free rec | |
| 72/1 | Read compl | (0:8) error, (8:8) ID | Number of records |
| 72/2 | Write init | (0:8) # rec, (8:8) ID | Number of free records |
| 72/3 | Write compl | (0:8) error, (8:8) ID | Number of free records |
| 72/4 | Control | (0:8) error, (8:8) ID | (0:4) func, (4:12) parm |
| 72/5 | EOF | (0:8) error, (8:8) ID | Number of records |
| 72/6 | Open | (0:8) error, (8:8) ID | Number of records |
| 72/7 | Close | (8:8) #free, (8:8) ID | Number of records |
| 72/10 | Initiation | 0 | (0:8) fix, (8:8) update |
| 73/0 | Put record | (0:8) error, (8:8) ID | (0:3) rec type, (3:13) number of records |
| 73/1 | Delete rec | (0:8) error, (8:8) ID | (0:3) rec type (3:13) number of records |
| 73/2 | Delete blk | Start of file block # | End of file block # |

Notes:

1. The aa/bb notation in the "octal value" column denotes type/subtype. Type is the actual MMSTRT event number. Subtype is (0|4) of parameter 0.

2. Several items can possibly exceed their fields, in that case the bits beyond the field are lost. These items are number of records, number of free records, start of file, and end of file.





3. Parameter word zero has a common format for all the MMSTAT events.

| Field | Description |
|---|---|
| (0:4) | Event's subtype. |
| (4:2) | File's state<br>0 - empty<br>1 - partially full<br>2 - only a fraction of a free record is left<br>3 - completely full |
| (6:1) | Nonzero indicatee that there is one or more waiting readers. |
| (7:1) | Nonzero indicates that there is one or more waiting writers. |
| (11:1) | Nonzero indicatee that the write has a carriage control character. |
| (12:4) | Flags local to the acceseor.<br>(12:1) - the accessor has done no FREADs/FWRITEs<br>(13:1) - extended wait<br>(14:1) - nondestructive read<br>(15:1) - writer has not written any records |





File Syeten Basic IPC Definitions

The objective of thie eet of uncallable procedures is to provide a simple ipc mechaniem to support the ipc file access procedures. It enables one procese to send short, control meseagee to another process.

General Behavior

FCPORTOPEN Procedure

The heart of this mechanism is the port. A procees desiring to receive messages would first open (create) a port. Thie procese ie termed the "port manager." When the port is created, a port number ie returned to the opener. Since the port number value cannot be known in advance, potential senders need some method of obtaining the port nunber fron the port nanager.

Both the ports and the messages are contained in a eingle disc reeident data segment. There can be a total of over thiry-five hundred open ports and outstanding messages Thus neither ports nor nessage blocke are scarce resources.

fCPORTSEND Procedure

This procedure sends a 0 to 5 word message to a port. Optionally a timeout value may be specified which will limit the duration the message will remain attached to the port. Expiration of the timeout causes the message to be deleted fron the target port's queue and placed on the sender's reply port (specified by the sender in the FCPORTSEND procedure call).

FCPORTRECEIVE

Reads and deletes the head message fron a port. The eender's return port number is aleo given to the receiver, enabling him to send a reply message.

FCPORTCLOSE

Demolishes the port.

IPC file's use of this mechanism

All open message files have two ports open for the file (read wait queue and write wait queue), plus one port per accessor (reply port). Their use is described in the following.





Reader and writer wait queuee

When an empty message file is acceeeed by more than one reader (share), then there must be a way of having the readers' FRERDs eatiefied in the eame order that they were iesued. That is, there muet be queue of waiting readers. The ipc access procedures accomplish thie by dedicating a baeic ipc port ae a "read wait queue." Whenever a reader's request ie etalled because the file is empty, a message is eent to the read wait queue. Subsequent FRERDs by other proceeses will queue up behind the first reader in a FIFO manner. An FWRITE will take the first entry fron the wait queue and send a "read nay be done" nessage to the reader's reply port.

In a like nanner multiple writere will queue on the write wait queue when the file is full.

Completion notification for nowait I/O

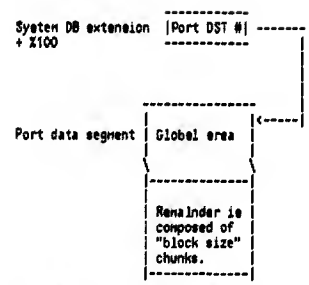
The IOWAIT intrineic waite for a message to be eent to the reply port (s) of the specified ueer filee.

Timeoute

When an accessor encountere a boundary condition (ex, a reader acceeees an empty file), it nay specify that the condition must be satiefied in x eeconds (FCONTROL 4). To this end the ipc access proceduree nerely issue the FCPORTSEND to the wait queue with the user'e tineout value specified. The timeout will tear the neeeage fron the wait queue and place it on the acceesor's reply port.

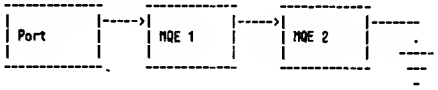
## Port Data Structures

### Port Data Segment




The chunks are a combination of free entries, ports, message queue entries, and timer list entries.

### Port With Two Outstanding Messages








### Port Number

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Port index | | | | | | | | Port data segment relative addr/8 | | | | | | | | |

Port index  Index into the port DST number array

### Port DST Number Array

Located in System DB Extension Area.

| | |
|---|---|
| 64 | Port data segment number |
| 65 | Reserved for a second port segment |





### Port Data Segment Global Area

| | | |
|---|---|---|
| 0 | Data segment number of this port data segment | 0 |
| 1 | Block size in words | 1 |
| 2 | Total number of blocks | 2 |
| 3 | Maximum number of blocks | 3 |
| 4 | Current number of free blocks | 4 |
| 5 | Number of open ports | 5 |
| 6 | Head of free list | 6 |
| 7 | Tail of free list | 7 |
| 10 | Head of impeded process list | 8 |
| 11 | Tail of impeded process list | 9 |
| 12 | Head of timeout thread (TQE address) | 10 |
| 13 | TRLX of timeout | 11 |
| 14 | Value returned by TIMER intrinsic when | 12 |
| 15 | Timeout was initiated. | 13 |
| 16 | Head of port list (in units of port numbers). | 14 |
| 17 | Not used. | 15 |





### Port

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Head MQE address | | | | | | | | | | | | | | | | 0 |
| Tail MQE address | | | | | | | | | | | | | | | | 1 |
| E | W | | Next port number in port list thread | | | | | | | | | | | | | 2 |
| I | Subtype | | Port Pin number | | | | | | | | | | | | | 3 |
| Soft interrupt parameter one | | | | | | | | | | | | | | | | 4 |
| Number of MQEs in the port's queue | | | | | | | | | | | | | | | | 5 |
| Number of sends to this port | | | | | | | | | | | | | | | | 6 |
| Soft interrupt plabel | | | | | | | | | | | | | | | | 7 |
| PIN of port's owner | | | | | | | | | | | | | | | | 10 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |

E  Enable wake up bit
0 - Do not awaken the process
1 - Awaken the process

W type  Action to be taken on an enabled port when a message is received.

0 - Awaken the process on a message wait bit.

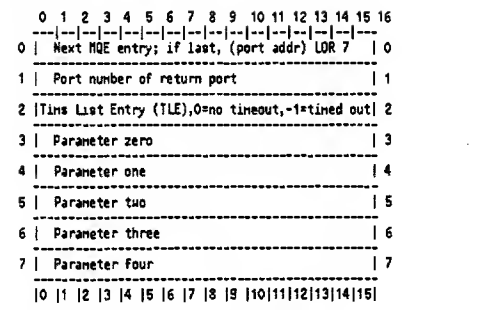
1 - Generate user software interrupt

2 - Generate system software interrupt

I  Interrupt mode.

Subtype  Soft interrupt subtype

Message Queue Entry (MQE)




Timer entry definitions - 0 - no timeout
1 - timeout expired
2 - TLE address for a pending timeout

File System Message Files

Wait Message

parm#
0 - WRITER ID
1 - LOCRL FLAGS (differ with each accessor)
(0:1) - accessor just opened file
(1:1) - will wait on boundary condition if no synbiotic process
(3:1) - writer has not written a record
(4:1) - transmission log in bytes
(8:1) - carriage control code
2 - OST# of data buffer
3 - Address of data buffer (OST relative)
4 - Length of data buffer in bytes

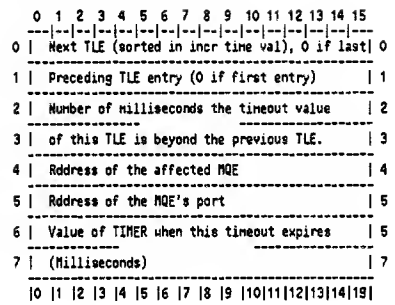
Completion Message

0 - Resultant error code
1 - Resultant transmission log in bytes





Timer List Entry (TLE)




MMSTRT Definitions

| Octal Value | Event Type | Parameter 0 | Parameter 1 | Parameter 2 |
|---|---|---|---|---|
| 62 | Open | Port number | Port OST num | Flags parameter |
| 63 | Receive completion | Port number | MQE address 15:1 Waitspc | Return port |
| 64 | Send | Port number | MQE address 15:1 Q type | Return port |
| 65 | Change status | Port number | 0 = enable 1 = disable | Head MQE address |
| 66 | Abort | Port number | Parameter zero | Rsturn port |
| 67 | Close | Port number | Port OST | # open ports left |
| 70 | Expand | Port OST num | # expand blks | Total # blocks |
| 71 | Timout expired | Port num | MQE address | Return port |

## CHRPTER 19 MPE MEMORY RESIDENT MESSRGE FACILITY

### Overvieu of Facility

The nenory resident nessage facility of MPE V addreseee the need for sn sffi-cient, eimple, and uniform nethod for systen code to eend ehort ststus-typs neesages to processes.

Esch processs is created uith a "port" in the neseage harbor table (DST %71) uhich eupports s set of neesage eubqueues uhich are private to that proces. There is a naximum of four eubqueues per port in the initial inplementstion. This limit can be eseily extended uhen new eubqueues are required.

Any systen code, evsn code running on the ICS, can esnd s neseage to any sub-queus of any process. The destination process' PIN nust be known, any a priori convsntions on subqueue number snd neeeage formats must be ee-tsblishsd. The csller of SENDMSG nay optionslly specify that the destination proces be auakended fron s message usit.

Neseage csn be any lsngth up to the configured naxinun. Nssesge length ie specified in the call to SENDMSG and RECEIVEMSG. In ths initisl inplenenta-tion, nessages are linited to 6 words in length uith 4 words available for dsta. Thie nsxinun can essily be increased if the need srisss.

By cslling PDRTSTRTUS, s process nay st any time determine uhether a specified subqueue is non-smpty or obtsin the subqueue numbsr of ths nost ur-gent non-snpty eubqusue (louest nunbered one).

By cslling RECEIVEMSG, s procsss nay receive ths nesssgs st ths head of the specified subqueue. This recsivs is optionally non-destructive.

R process can uait on s nessage usit, or on s conbinstion of nessage usit and other usit types.

### Messsge Intrinsics

SENDMSG

```
Procsdure SENDMSG(Destpin, Subqueue, MsgLength, Flsgs);
Valus             Destpin, Subqueue, MsgLength, Flsgs;
Integer           Dsstpin, Subqueue, MsgLength;
Logical                                         Flsgs;
Option Privilsgsd, Uncallable;
```

Destpin, Subqueue, and MsgLength hsvs to bs within rsnge or s System Fsilure 622 uill occur.

The csller of SENDMSG stscks the nessags contents before calling the procs-dure. SENDMSG expscts the first nsg uord to bs st Q-7-MsgLength, snd the last nsg uord st Q-8. The nesssge contents st Q-8 to Q-7-MsgLsngth sre deleted fron ths top of stsck by ths exit fron SENDMSG to ths csllsr.





Flags.(1:1) = 1 ==> Wske-up deetination process fron s nssssgs usit.

Return CC = CCG if proceee uae slready suske else CC = CCE.

PORTSTRTUS

```
Logical Procedure PDRTSTRTUS(Subqueue);
Value                        Subqusue;
Integer                      Subqueue;
Option Privileged, Uncallable;
```

Whsn supplisd a valid subqueue nunber, PDRTSTRTUS returns a true value if the subqusus ie non-empty and a false vslue if the eubqueue ie empty.

Whsn psssed s -1 s subqueue paraneter, PDRTSTRTUS returns ths eubqueve nunber of ths processs' nost urgsnt non-empty eubqueue (the ensller the number, the nore urgsnt ths subqusue).

If all subqueues sre snpty, PDRTSTRTUS returns CC - CCE. If at lesst one eubqueue is non-empty, PDRTSTRTUS returne CC = CCG.

RECEIVEMSG

```
Procedure RECEIVEMSG(Subqusue, MsgLength, Flsgs);
Vslus                Subqusus, MegLength, Flags;
Intsgsr              Subqusus, MsgLength;
Logicsl                                   Flsgs;
Option Privilsged, Uncsllsbls;
```

Subqueue snd MsgLength hss bsttsr bs uithin rsnge or s Systsn Failure 622 uill occur.

Ths csllsr of RECEIVEMSG does an RSSEMBLE(ADDS MsgLength) to nsks spsce for the nessags contents. RECEIVEMSG stores the nssssgs contents into Q-8, Q-9,...,Q-7-MsgLength. Q-7-MsgLength contsins the first word of ths nssssgs.

Flsgs.(0:1) ==> do not relsase nesssgs fron head of subqueue (non dsstructivs read).

Rsturn CC = CCG if sll subqueues were empty, slse CC = CCE.

```
| 0| 1| 2| 3| 4| 5| 6|
+--+--+--+--+--+--+--+
|LS| L|    DATA      |  LS = Subqueue or Link
+--+--+--------------+   L = Length (2-6)
```





### Supporting Dsts Structures

Message Harbor Tsble [DST #57 (%71)]

```
 0 | DST Index Numbsr (%71)     |
   +-----------------------------+
 1 | Data Segment Sizs          |
   +-----------------------------+
 2 | Reserved                   |
   +-----------------------------+
 3 | Maximum number of PINS + 1 |
   +-----------------------------+
 4 | Maximum Msg Size (6)       |
   +-----------------------------+
 5 | Reserved                   |
   +-----------------------------+
 6 | Message Pool Head Pointer  |
   +-----------------------------+
 7 | Message Pool Tsil Pointer  |
   +-----------------------------+
 8 | Avsilsble Msg Frames Count |
   +-----------------------------+
 9 | Head of inpeded queue      |
   +-----------------------------+
10 | Tsil of inpeded queue      |
   +-----------------------------+
11 | Rsserved                   |
   |                            |
   +-----------------------------+
13 | Ports     (16 words each)  |
   | (8 for headsr + 2 link words |
   |  for sach of 5 subqueues)  |
   +-----------------------------+
   | Mesasgss  (6 words each)   |
   | (2 for hesder + 4 for dats) |
   +-----------------------------+
```

# CHAPTER 20 MMSTATS EVENTS

## MMSTATS Catalog Index













## MMSTAT CATALOG INDEX







## MMSTAT Event Group 0 (Memory Management Events)

Event 0

EVENT NAME: QDNSEG
DESCRIPTION: ABSENCE TRAP ON CODE/DATA SEGMENT

CALLING MODULE: KERNELC
CALLING PROCEDURE(S): QUEUEDNSEGMENT

PARAMETER DESCRIPTION

P1,P2 = Segment Identifier

P1.(0:4) = Segment type field
- 0 => Data Segment
- 1 => SL Segment
- 2 => Program Segment
- 3 => Cache Domain

P1.(4:12) = Program index into CSTBLK (type 2 only)

P2 = Segment Number

P3 = SLL Pointer (SLL table relative)

P4 = STATUS (in stack marker) of calling (trapping) segment

P5,P6 - Unused.

Event 1

```
EVENT NAME:  MAKEDC
DESCRIPTION: MAKE SEGMENT AN OVERLAY CANDIDATE - RELEASE SEGMENT
             TO THE POOL OF AVAILABLE SPACE

CALLING MODULE:  KERNELC
CALLING PROCEDURE:  MAKEDC

     PARAMETER DESCRIPTION
     ---------------------

     P1,P2 = Segment Identifier

             P1.(0:4)  = Segment type field
                         0   => Data Segment
                         1   => SL Segment
                         2   => Program Segment
                         3   => Cache Domain

             P1.(4:12) = Program index into CSTBLK (type 2 only)

             P2        = Segment Number


     P3   =  Bank of region
     P4   =  Address of region

     P5,P6 - Unused.
```





Event 2

```
EVENT NAME:  SPECIALRQ
DESCRIPTION:  REQUEST OF SEGMENT EXPANSION/CONTRACTION, UNLOCK,
              UNFREEZE, IOUNFREEZE, LOCK, IOFREEZE, FREEZE

CALLING MODULE:  KERNELC, KERNELD, ININ
CALLING PROCEDURES:  UNLOCKSEG', IOFREEZE', FETCHSEGMENT-(KERNELC)
                     DLSIZE, ZSIZE, GETPXSEG, ALTDSEGSIZE,
                     ALTPXFILESIZE                        -(KERNELD)
                     STACKOVERFLOW                        -(ININ)

     PARAMETER DESCRIPTION
     ---------------------

     P1,P2 = Segment Identifier

             P1.(0:4)  = Segment type field
                         0   => Data Segment
                         1   => SL Segment
                         2   => Program Segment
                         3   => Cache Domain

             P1.(4:12) = Program index into CSTBLK (type 2 only)

             P2        = Segment Number

     P3 = .(0:1)   =1 => Request is through FETCHSEGMENT
                         (types 0,1,2)
          .(12:4)  Type of request
                   =  0=> IOFREEZE
                   =  1=> FREEZE
                   =  2=> LOCK
                   =  3=> IOUNFREEZE
                   =  4=> UNFREEZE
                   =  5=> UNLOCK
                   =  6=> DLSIZE EXPANSION
                   =  7=> DLSIZE CONTRACTION
                   =  8=> PXFIXED EXPANSION
                   =  9=> PXFILE EXPANSION
                   = 10=> PXFILE CONTRACTION
                   = 11=> XDS EXPANSION
                   = 12=> XDS CONTRACTION
                   = 13=> ZSIZE EXPANSION
                   = 14=> ZSIZE CONTRACTION
                   = 15=> STACKOVERFLOW

      P4 = For types (P3.(12:4))
             = 0,2,3,5 => P4.(8:8) = LOCK OR IOFREEZE COUNT
             = 1,4 => P4.(0:8) = FREEZE COUNT
             = 6-15 => REQUESTED SIZE OF ARER IN WORDS

      P5,P6 - Unused.
```





Event 4

```
EVENT NAME:  FETCHSEG
DESCRIPTION:  SEGMENT REQUEST (FOR I/O SYSTEM OR PROCESS)

CALLING MODULE:  KERNELC
CALLING PROCEDURE:  FETCHSEGMENT

     PARAMETER DESCRIPTION
     ---------------------

     P1,P2 = Segment Identifier

             P1.(0:4)  = Segment type field
                         0   => Data Segment
                         1   => SL Segment
                         2   => Program Segment
                         3   => Cache Domain
             P1.(4:12) = Program index into CSTBLK (type 2 only)

             P2        = Segment Number

     P3 = Requester ID
          .(0:1) = 1   => I/O System request
                          .(1:15) = Ldev N
          .(0:1) = 0   => Process request
                          .(1:15) = Pin N of requesting process

          .(1:1) = 1   => IOFREEZE REQUEST
          .(2:1) = 1   => BLOCKED LOCK REQUEST
          .(3:1) = 1   => LOCK REQUEST
          .(4:1) = 1   => FREEZE REQUEST

     P4=  .(13:3)= 0   => Segment already present
                 = 1   => Segment is Recover Overlay Candidate
                 = 2   => Segment already on its way in for someone
                          (Segment In Motion In)
                 = 3   => Segment not present -- must fetch
                          (Full fetch)

     P5,P6 - Unused.
```





Event 5

```
EVENT NAME:  SEGID
DESCRIPTION:  MEMORY MANAGEMENT READ/WRITE OF SEGMENT FROM/TO
              DISC QUEUED

CALLING MODULE:  KERNELC
CALLING PROCEDURES:  PROCESSINITMSG, STARTSEGWRITE

     PARAMETER DESCRIPTION
     ---------------------
     P1,P2 = Segment Identifier

             P1.(0:4)  = Segment type field
                         0   => Data Segment
                         1   => SL Segment
                         2   => Program Segment
                         3   => Cache Domain

             P1.(4:12) = Program index into CSTBLK (type 2 only)

             P2        = Segment Number

     P3 = Disc Request Index - (DRQ Table relative)

     P4 = .(0:1) = 1  => WRITE STRRT
                 = 0  => RERD STRRT
          .(1:15)= Ldev N

     P5,P6 - Unused.
```

Event 6

EVENT NAME: SIODONE
DESCRIPTION: MEMORY MANAGEMENT SEGMENT READ/WRITE FROM/TO DISC COMPLETE

CALLING MODULE: KERNELC
CALLING PROCEDURES: SEGREADCOMPLETOR, SEGWRITECOMPLETOR

PARAMETER DESCRIPTION
---

P1,P2 = Segment Identifier

P1.(0:4) = Segment type field
0 => Data Segment
1 => SL Segment
2 => Program Segment
3 => Cache Domain

P1.(4:12) = Progran index into CST8LK (type 2 only)

P2 = Segment Number

P3 = Disc Request Index (DRQ Table relative)
P4 = .(0:1) = 1 => Write complete
= 0 => Read conplete

P5,P6 - Unused.

Event 7 (%7)

EVENT NAME: CGARBAGE
EVENT DESCRIPTION: GARBAGE COLLECTION HAS JUST TAKEN PLACE

CALLING MODULE: KERNELC
CALLING PROCEDURE: COLLECTGARBAGE

PARAMETER DESCRIPTION
---
P1 = BANK OF SOURCE JUST MOVED FROM
P2 = ADDR OF SOURCE JUST MOVED FROM
P3 = MOVEPAGECNT, NUMBER OF PAGES JUST MOVED FROM
P4,P5,P6 - Unused.





Event 8 (%10)

EVENT NAME: SWAPIN
DESCRIPTION: SWAP IN A PROCESS

CALLING MODULE: KERNELC
CALLING PROCEDURE: SWAPIN

PARAMETER DESCRIPTION
---

P1 = PIN OF PROCESS BEING SWAPPED IN
P2 = .(0:1) = 0 => BEING SWAP
= 1 => END SWAP
.(1:1) = 0 => NORMAL (PARTIAL SWAP OK)
= 1 => SWAP REQUIRED
.(12:4)= 0 => PROCESS SWAPIN COMPLETE
2 => NO ROOM, HARD REQ MAY SUCCEED
3 => NO ROOM, HARD REQ FAILED
4 => SWAPIN STOPPED - MORE URGENT ACTIVITY
8 => NO LOCK SPACE
P3 = HARDREQUEST = TRUE => HARD REQUEST ON SWAPIN
FALSE=> NORMAL

P4,P5,P6 - Unused.





MMSTAT Event Group 1 (Memory Manager)

Event 12 (%14)

EVENT NAME: ALLOCMEM
DESCRIPTION: FOUND A HOLE FOR A SEGMENT REPLACEMENT REQUEST

CALLING MODULE: KERNELC
CALLING PROCEDURE: RESERVEREGION

PARAMETER DESCRIPTION
---
P1 = REQUESTED SIZE IN PAGES
P2 = BANK OF SELECTED REGION
P3 = ADDRESS OF SELECTED REGION
P4,P5,P6 - Unused.

Event 13 (%15)

EVENT NAME: DEALLOCM
DESCRIPTION: RELEASE REGION OF MEMORY TO AVAILABLE STATUS

CALLING MODULE: KERNELC
CALLING PROCEDURE: RELEASEREGION

PARAMETER DESCRIPTION
---

P1 = SIZE RELEASED IN PAGES
P2 = BANK OF RELEASED REGION BASE
P3 = ADDRESS OF RELEASED REGION BASE
P4,P5,P6 - Unused.





Event 14 (%16)

Event Name: CACHEMOV
Description: A cache nove (i.e. logical disc request) has just completed.
Calling Module: CACHESEG
Calling Procedure: ProcessCDTLogReqQue

Parameter Description
---

P1,P2 = Segment identifier of target DST (LDA'BUFOST)
P2.(0:1) = 1 then this is a stack.
P3 = Mapped Domain CDT entry number
P4 = Transfer count
P5,P6 = Unused

Event 15 (%17)

Event Name: GET_CDT
Description: Called when an entry in the CDT table is obtained or released.
Calling Module: CACHESEG
Calling Procedures: Get'CDT'Entry, CDT'Free'Entry, CDT'Get'MD'Entry, CDT'Rel'MD'Entry

Parameter Description
---

P1 = CDT entry number
P2 = Type of call
0 = Free entry
1 = Get entry
2 = Get Mapped Domain entry
3 = Release Mapped Domain entry
P3 = If P2=3 then Ldev Entry number
P4,P5,P6 Not used.

Event 16 (X20)

Event Name: QUE_LDR
Description: Called when an LDR is queued onto the CDT
Calling Module: CACHESEG
Calling Procedure: CDT'Queue'LDR

Parameter Description
---

P1 = Mapped Domain CDT entry number
P2 = LDR entry index to be queued
P3 = Queue type
X12 - CDT impeded queue
X13 - CDT active queue
P4,P5,P6 Not used.

Event 17 (X21)

Event Name: DQUE_LDR
Description: Called when an LDR is removed from the CDT queue.
Calling Module: CACHESEG
Calling Procedure: CDT'Dequeue'LDR

Parameter Description
---

P1 = Mapped Domain CDT entry number
P2 = LDR entry index being removed from the queue
P3 = Queue type
X12 - CDT impeded queue
X13 - CDT active queue
P4,P5,P6 Not used.

Event 18 (X22)

Event Name: FIND_DE
Description: Called when need to find an assigned CDT
Device entry.
Calling Module: CACHESEG
Calling Procedure: CDT'Find'DE

Parameter Description
---

P1 = Ldev number of the CDT Device entry to be found.
P2 = CDT Device entry
P3,P4,P5,P6 Not used.





MMSTAT Event Group 2

Event -20 (-X24)

EVENT NAME: ALCSTBLK
DESCRIPTION: REQUEST TO RESERVE A BLOCK OF ENTRIES IN THE CSTX

CALLING MODULE: KERNELD
CALLING PROCEDURE: ALCSTBLOCK

PARAMETER DESCRIPTION
---

P1=EIX CST BLOCK INDEX ASSIGNED
P2=CSTX DST RELATIVE INDEX OF WORD 0
OF THE FIRST RESERVED CSTX ENTRY
P3=N NUMBER OF CSTX ENTRIES RESERVED
P4,P5,P6 - Unused.

Event -21 (X25)

EVENT NAME: DEALCSTBLK
DESCRIPTION: INDICATES THAT A CST EXTENSION BLOCK HAS BEEN
DEALLOCATED

CALLING MODULE: KERNELD
CALLING PROCEDURE: DEALCSTBLOCK

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1=EIX | CST BLOCK INDEX ASSIGNED TO THE BLOCK OF CST ENTRIES |
| P2=CSTX | DST RELATIVE INDEX OF WORD 0 OF THE FIRST CST ENTRY TO BE RELEASED |
| P3=MCNT | =(NALLOCATED CSTX ENTRIES-NENTRIES BEING RELEASED)*4 |
| P4,P5,P6 - Unused. | |





Event -23 (-X27)

EVENT NAME:RELRESOURCES
DESCRIPTION: RESOURCES (VOS,MAIN MEMORY, ST ENTRY) RESERVED FOR THE
FOR THE SEGMENT HAVE BEEN RELEASED

CALLING MODULE: KERNELD

CALLING PROCEDURE: RELDATASEG

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1=NEW OB OST NUMBER | |
| P2=DELTA P AT EXCHANGEOB CALL | |
| P3=STATUS AT EXCHANGEOB CALL | |
| P4,P5,P6 - Unused. | |

MMSTAT Event Group 3

(NOT CURRENTLY ASSIGNED)





MMSTAT Event Group 4 (Scheduling)

Event 40 (X50)

EVENT NAME: QUIESCE
DESCRIPTION: PROCESS SWITCH - STATE OF PROCESS SAVED

CALLING MODULE: KERNELC
CALLING PROCEDURE: DSP

PARAMETER DESCRIPTION
---

P1 = PCB00(CPCB)
.(0:1) = 1 => SAR - SCHEDULING ATTENTION REQUIRED
.(2:1) = 1 => CRIT - PROCESS IS CRITICAL
.(3:1) = 1 => HSIR - PROCESS HAS SIR
.(4:1) = 1 => PIOVR - PENDING PI, PROCESS CRITICAL
.(5:1) = 1 => HSPRI - HOLD SIR PRIORITY
.(6:1) = 1 => IPEXP - INCORE PROTECT EXPIRED
.(7:1) = 1 => PC - PREEMPT CAPABILITY
.(8:1) = 1 => MP - MUST PREEMPT
.(9:1) = 1 => LW - LONG WAIT
.(10:1)= 1 => SW - SHORT WAIT
.(11:1)= 1 => TRW - TERMINAL READ WAIT
.(12:1) =1 => USEQD - USED A QUANTUM SINCE TRANSACTION BEGAN
.(13:1)= 1 => HIPRI - HOLD IMPEDED PRIORITY
.(14:1)= 1 => ALLOW SOFT INTERRUPTS EVEN THOUGH IN SYSTEM CODE
.(15:1)= 1 => RITBK - PROCESS IN RIT BREAK

P2 = PCB04(CPCB)
.(0:1) = 1 => M - MOURNING WAIT
.(1:1) = 1 => RG - GLOBAL RIN WAIT
.(2:1) = 1 => RL - LOCAL RIN WAIT
.(3:1) = 1 => MA - MAIL WAIT
.(4:1) = 1 => BIO - BLOCKED IO WAIT
.(5:1) = 1 => IO - IO WAIT
.(6:1) = 1 => UCP - UCOP WAIT, RIT WAIT
.(7:1) = 1 => JNK - JUNK WAIT
.(8:1) = 1 => TIM - TIMER WAIT
.(9:1) = 1 => INT - INTERRUPT WAIT
.(10:1)= 1 => SON - SON WAIT
.(11:1)= 1 => FA - FATHER WAIT
.(12:1)= 1 => IMP - PROCESS WAITING TO UNIMPEDED
.(13:1)= 1 => SIR - PROCESS WAITING FOR SIR
.(14:1)= 1 => TIM - PROCESS WAITING FOR TIME OUT
.(15:1)= 1 => MEM - PROCESS WAITING FOR MEMORY

P3 = PCB13(CPCB)
.(0:1) = 1 => DISPQ - PROCESS ON DISPATCHING QUEUE

.(1:1) = 1 => L SCHEDULING CLASS
.(2:1) = 1 => C SCHEDULING CLASS
.(3:1) = 1 => D SCHEDULING CLASS
.(4:1) = 1 => E SCHEDULING CLASS
.(5:1) = 1 => INTER- PROCESS IS INTERACTIVE
.(6:1) = 1 => COMEA- PROCESS IS COME-RESIDENT
.(8:8) = PROCESS' SCHEDULING PRIORITY

P4,P5,P6 - Unused.

MMMSTAT Event Group 5

(SEE CHAPTER 18 FOR THESE EVENTS)





MMSTAT Event Group 6 (FILESYS)

THESE EVENTS ARE FOR DEVELOPMENT USE ONLY AND ARE NOT NORMALLY ENABLED

Event -60(X74)

EVENT NAME: FOPEN
DESCRIPTION: OLD FILE OPEN

CALLING MODULE: FILEACC

CALLING PROCEDURE: FOPENDA

PARAMETERS PARAMETER DESCRIPTION

P1= FILE # (0:2)=2 -> NON-SPOOLER ACCESS
(0:2).NE.2 ->

P2= AOPTIONS SEE INTRINSICS MANUAL
P3= FILE LABEL FOPTIONS SEE INTRINSICS MANUAL
P4= RECORD SIZE
P5= FILE LABEL BLOCK SIZE
P6= N OF BUFFERS





Event -61(X75)

EVENT NAME: FOPEN'
DESCRIPTION: OLD FILE OPEN (CONTINUATION OF EVENT -60)

CALLING MODULE: FILEACC

CALLING PROCEDURE: FOPENOA

PARAMETERS PARAMETER DESCRIPTION

P1= FILE LABEL FILE LIMIT MSW

P2= FILE LABEL FILE LIMIT LSW

P3= FILE LABEL # OF EXTENTS

P4-P6 unused

Event -60(X74)

EVENT NAME: FOPEN
DESCRIPTION: NEW DISC FILE OPEN

CALLING MODULE: FILEACC

CALLING PROCEDURE: FOPEN

PARAMETERS PARAMETER DESCRIPTION

P1= FILE N (0:2)=2 -> NON-SPOOLER ACCESS
(0:2).NE.2 ->
P2= AOPTIONS SEE INTRINSICS MANUAL

P3= FOPTIONS SEE INTRINSICS MANUAL

P4= RECORD SIZE

P5= BLOCK SIZE

P6= # OF BUFFERS





Event -61(X75)

EVENT NAME: FOPEN'
DESCRIPTION: NEW DISC FILE OPEN (CONTINUATION OF EVENT -60)

CALLING MODULE: FILEACC

CALLING PROCEDURE: FOPEN

PARAMETERS PARAMETER DESCRIPTION

P1= FCB FILE LIMIT

P2= FCB MAX # EXTENTS

P3= (0:8)= INITIAL ALLOCATION EXTENTS

P4-P6 unused

Event -62(X76)

EVENT NAME: FREAD
DESCRIPTION:

CRLLING MODULE: FILEIO

CALLING PROCEDURE: FRERD

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= ACBTLOG | TRANSFER COUNT |
| P3= FLAGS | (15:1) Buffer hit flag |

Event -63(X77)

EVENT NAME: FWRITE
DESCRIPTION:

CRLLING MODULE: FILEID

CRLLING PROCEDURE: FWRITE

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= TCOUNT | SEE INTRINSIC MANUAL |
| P3= FLAGS | (15:1) Buffer hit flag |





Event -64(X100)

EVENT NAME: FREADDIR
DESCRIPTION:

CRLLING MODULE: FILEIO

CRLLING PROCEDURE: FRERDDIR

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= ACBTLOG | TRANSFER COUNT |
| P3= FLAGS | (15:1) Buffer hit flag |
| P4= REC # | MSW |
| P5= REC # | LSW |
| P6= NOT USED | |





Event -65(X101)

EVENT NAME: FWRITEDIR
DESCRIPTION:

CRLLING MODULE: FILEID

CRLLING MODULE: FWRITEDIR

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILENUM | |
| P2= TCOUNT | See Intrinsic manual |
| P3= FLAGS | (15:1) Buffer hit flag |
| P4= REC # | MSW |
| P5= REC # | LSW |
| P6= NOT USED | |





Event -66(X102)

EVENT NAME: FUPDATE
DESCRIPTION:

CRLLING MODULE: FILEID

CRLLING PROCEDURE: FUPDATE

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= TCOUNT | See Intrinsic manual |
| P3= FLAGS | (15:1) Buffer hit flag |
| P4-P6 not used | |

Event -67(X103)

EVENT NAME: IOWRIT
DESCRIPTION:

CRLLING MODULE: FILEID

CALLING PROCEDURE: IOWRIT

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= ACBTLOG | TRANSFER COUNT |
| P3= FLAGS | (15:1) buffer hit flag |

Event -68(%104)

EVENT NAME: FREROSEEK
DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE: FREROSEEK

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= FLAGS | (15:1) buffer hit flag |
| P3= REC # | MSW |
| P4= REC # | LSW |
| P5-P6 not used | |

Event -69 (%105)

EVENT NAME: FSPACE
DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE: FSPACE

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= DISPLACEMENT | SEE INTRINSIC MANUAL |
| P3-P6 | not used |





MMSTRT Event Group 7 (FILESYS)

THESE EVENTS RRE FOR DEVELOPMENT USE ONLY RND ARE NOT NORMRLLY ENRBLED

Event -70 (%106)

EVENT NAME: FPOINT
DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE: FPOINT

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= REC # | MSW |
| P3= LSW | LSW |
| P4-P6 | not used |

Event -71 (%107)

EVENT NAME: FCONTROL
DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE: FCONTROL

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= CODE | See Intrinsics manual |
| P3-P6 | not used |





Event -72 (%110)

EVENT NAME: FSETMODE
DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE: FSETMODE

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= MODEFLAGS | SEE INTRINSIC MANUAL |
| P3-P6 | not used |

Event -74 (%112)

EVENT NAME: FCHECK
DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE: FCHECK

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= ERRORCODE | SEE INTRINSIC MANUAL |
| P3-P6 | not used |





Event -75 (%113)

EVENT NAME: FGETINFO
DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE: FGETINFO

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= FOPTIONS | SEE INTRINSIC MRNUAL |
| P3= AOPTIONS | SEE INTRINSIC MRNURL |
| P4-P6 | not used |

Event -76 (%114)

EVENT NAME: FREADLABEL
DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE:

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= TCOUNT | SEE INTRINSIC MANUAL |
| P3-P6 | unused |

Event -77 (%115)

EVENT NAME: FWRITELABEL
DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE: FWRITELABEL

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= TCOUNT | SEE INTRINSIC MANUAL |
| P3-P6 | unused |

Event -78 (%116)

EVENT NAME: FLOCK
DESCRIPTION:

CALLING MODULE: FILEID

CALLING PROCEDURE: FLOCK

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= LOCKCOND | See Intrinsice manual |
| P3= COND CODE | " " " " |





Event -79 (%117)

EVENT NAME: FUNLOCK
DESCRIPTION:

CALLING MODULE: FILEID

CALLING PROCEDURE: FUNLOCK

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2-P6 | unused |





MMSTAT Event Group 8

Event -80 (%120)

EVENT NAME: FRENAME
DESCRIPTION:

CALLING MODULE: FILEACC

CALLING PROCEDURE: FRENAME

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2-P6 | unused |

Event -81 (%121)

EVENT NAME: FCLOSE
DESCRIPTION:

CALLING MODULE: FILEACC

CALLING PROCEDURE: FCLOSE

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FILE # | |
| P2= DISP | See Intrinsic manual |
| P3= SECCODE | |
| P4-P6 | unused |





Event 83 (%123)

Event Name: STRATEGY
Description: Called to determine the type of strategy used
based on who the caller of CDT'ATTACHID ie.
Calling Module: CACHESEG
Calling Procedure: CDT'STRATEGY

Parameter Description
---

P1 = CDT Mapped Domain entry
P2 = LDR entry index
P3 = Strategy
0 - Unknown caller
1 - Unknown from File System
2 - Spooler
3 - Directory
4-7 - Unknown
8 - Genmessage
9 - File System, Quiesce I/O
10 - File System, sequential, NOBUF
11 - File System, direct, NOBUF
12 - File System, sequential, BUF
13 - File System, direct, BUF
14 - File System, KSAM
15 - File System, IMAGE
P4,P5,P6 Not used.

Event 84 (X124)

Event Name: INITIATE
Description: Called when starting/completing logical disc request.
Calling Module: CACHESEG
Calling Procedures: CDT'Initiator, CDT'Completor

Parameter Description
---

P1 = CDT Mapped Domain entry number
P2 = LDR entry index
P3 = type
0 = Initiator
1 - Completor
P4,P5,P6 Not used.

Event 86 (X126)

Event Name: CDT_ATT
Description: Called from CDT'ATTACHIO.
Calling Module: CACHESEG
Calling Procedure: CDT'Attachio

Parameter Description
---

P1 = Ldev
P2 = Function
P3 = Flags
P4,P5 = Parm1, Parm2
P6 = Count

Event 87 (X127)

Event Name: MAP_DDM
Description: Called when need to "map" a disc domain.
Calling Module: CACHESEG
Calling Procedure: CDT'MAP'CACHED'DDMAIN

Parameter Description
---

P1 = New CDT entry number
P2 = Returned CDT entry
P3,P4,P5,P6 Not used.





Event 88 (X130)

Event Name: UN_MAP_RG
Description: Called when disc domain no longer mapped. (i.e. both the logical and physical I/D is complete).
Calling Module: CACHESEG
Calling Procedure: CDT'MAP'CACHED'REGION

Parameter Description
---

P1 = CDT Ldev entry number
P2 = Region CDT entry number
P3,P4,P5,P6 Not used.

Event 89 (X131)

Event Name: LINK_REG
Description: Called when a disc domain gets linked into the linked list of domains for an ldev.
Calling Module: CACHESEG
Calling Procedure: LINK'CACHED'REGION,UNLINK'CACHED'REGION

Parameter Description
---

P1 = Type
0 = Link
1 = Unlink
P2,P3 = Address of region base
P4 = CDT entry number found in the header
P5 = # of pages
P6 Not used.





MMSTAT Event Group 9 (Disc I/O Requests)

Event 90 (X132)

Event Name: REQCACHE
Description: Called to see if caching will accept this I/O request.
Calling Module: CACHESEG
Calling Procedure: REQUEST'CACHE

Parameter Description
---

P1 = LDR entry index
P2,P3,P4,P5,P6 Not used.

Event -98 (X142)

EVENT NAME: DISK TRAFFIC
DESCRIPTION: DISC I/O REQUEST HAS BEEN QUEUED

CALLING MODULE: HARDAES

CALLING PROCEDURE: ATTACHIO

PARAMETERS PARAMETER DESCRIPTION

P1=CNT DATA TRANSFER COUNT:WORDS IF >0; BYTES IF <0
P2=FLAGS.(0:4)
P3=FNCT =0 ==>READ
=1 ==>WRITE
=2 ==>OPEN FILE
=3 ==>CLOSE FILE
=4 ==>CLOSE DEVICE





MMSTAT Event Group 10

Event 100 (X144)

EVENT NAME: DISK ERROR
DESCRIPTION: RECORD DISC ERROR

CALLING MODULE: IOFDISC1

CALLING PROCEDURE: FHDDVR

PARAMETERS PARAMETER DESCRIPTION

P1=DIPT(DSTAT) HARDWARE STATUS
P2=SO QMISC
P3=IOQP(QLDEV).QLDEVN LOR STDCOUNT&LSL(8))
=LDEV/SID PROGRAM COUNTER

Event 101 (X145)

EVENT NAME: DISK ERROR
DESCRIPTION: RECORD DISC ERROR

CALLING MODULE: IOMDISCD

CALLING PROCEDURE: MHDDVR

PARAMETERS PARAMETER DESCRIPTION

P1=DIPT(DSTAT) HARDWARE STATUS
P2=SO QMISC
P3=IOQP(QLDEV).QLDEVN LOR STDCOUNT&LSL(8))
=LDEV/SID PROGRAM COUNTER

## MMSTAT Event Group 11

Event -110 (X156)

EVENT NAME: START I/O
DESCRIPTION:DRIVER INITIATOR FOR SIO DEVICE HAS BEEN CALLED

CALLING MODULE: HARDAES

CALLING PROCEDURE: SIODM

PARAMETERS PARAMETER DESCRIPTION

P1=IOQPL(QSTAT) LOR IOQPL(QLDEV).LDEVN
=(0:8) PCB ENTRY # OF PROCESS MAKING REQUEST
(8:8) LOGICAL DEVICE NUMBER OF DEVICE FOR I/O
P2=IOQP(QWBCT)=WORD COUNT IF>0;BYTE COUNT IF<0
P3=(0:2) = FUNCTION CODE SPECIFIED BY DRIVER

= 0 => READ
= 1 => WRITE
= 2 => CONTROL

=(6:10)= DSTN OF TARGET DATA SEG

Event -111 (X157)

EVENT NAME: I/O COMPLETION
DESCRIPTION: SIO COMPLETION

CALLING MODULE: HARDRES

CALLING PROCEDURE: SIODM

PARAMETERS PARAMETER DESCRIPTION

P1=IOQP(QLDEV).LDEVN=LOGICAL DEVICE NUMBER OF
DISC INVOLVED IN TRANSFER
P2=IOQP(QPAR1) (DEFINED BY DRIVER)
P3=IOQP(QPAR2) (DEFINED BY DRIVER)





## MMSTAT Event Group 12

Event 120 (X170)

EVENT NAME: SOFT'DEATH
DESCRIPTION: BUG CATCHER

CALLING MODULE: HARDRES

CALLING PROCEDURE: SOFT'DEATH

PARAMETERS PARAMETER DESCRIPTION

P1 SOFT'DEATH I.D. NUMBER
P2 CALLERS STATUS REGISTER
P3 CALLERS DELTA P

Event 125 (X175)

EVENT NAME: IOBUFTRP
EVENT DESCRIPTION: IOSYSTEM BUFFER TRAP

CALLING MODULE: HARDRES
CALLING PROCEDURE: SIODM

PARAMETER DESCRIPTION
---
P1 = IOQP
P2 = IOQP(QDSTN).DSTN = DST NUMBER OF BUFFER
P3 = 0





## MMSTAT Event Group 13

Event 139 (X213)

Event Name: C_ABSENT
Description: Either the mapped disc domain or the target
DST was absent when a cache move was attempted.
Calling Module: CACHESEG
Calling Procedure: PROCESSCDTLOGREQQUEUE

Parameter Description
---

P1 = 0 Mapped Domain absent
P2 = Pin
P3,P4 = Segment identifier of Mapped Domain
P5,P6 Not used.

P1 = LDR entry index (DST not present)
P2 = Pin
P3,P4 = Segment identifier of DST (P4.(0:1) = 1 stack)
P5,P6 Not used.





## MMSTAT Event Group 14 (CS/3000)

Event 140 (X214)

EVENT NAME: COPEN
DESCRIPTION:

CALLING MODULE: COMSYS2

CALLING PROCEDURE: COPEN

PARAMETERS PARAMETER DESCRIPTION

P1 (0:8) = CS ERROR CODE
(8:8) = LOGICAL DEVICE NUMBER

P2 PMAP1

P3 PMAP2

Event 142 (%216)

EVENT NAME: CABORTIO
DESCRIPTION:

CALLING MODULE: COMSYS1

CALLING PROCEDURE: CABORTIO

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1 | LOGICAL DEVICE |
| P2 | IOQINDEX |
| P3 | 0 |





Event 144 (%220)

EVENT NAME: CSIOWRIT
DESCRIPTION:

CALLING MODULE: COMSYS1

CALLING PROCEDURE: CSIOWRIT

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1 | (0:8) = CS ERROR CODE<br>(8:8) = LOGICAL DEVICE NUMBER |
| P2 | TRANSMISSION LOG |
| P3 | |

Event 146 (%222)

EVENT NAME: CCLOSE
DESCRIPTION:

CALLING MODULE: COMSYS3

CALLING PROCEDURE: CCLOSE

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1 | (0:8) = CS ERROR CODE<br>(8:8) = LOGICAL DEVICE NUMBER |
| P2 | LINE NUMBER |
| P3 | 0 |





Event 147 (%223)

EVENT NAME: CREAD
DESCRIPTION:

CALLING MODULE: COMSYS4

CALLING PROCEDURE: CREAD

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1 | (0:8) = CS ERROR CODE<br>(8:8) = LOGICAL DEVICE NUMBER |
| P2 | INCOUNT |
| P3 | STATION |

Event 149 (%225)

EVENT NAME: CWRITE
DESCRIPTION:

CALLING MODULE: COMSYS4

CALLING PROCEDURE: CWRITE

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1 | (0:8) = CS ERROR CODE<br>(8:8) = LOGICAL DEVICE NUMBER |
| P2 | OUTCOUNT |
| P3 | INCOUNT |





MMSTRT Event Group 15 (CS/3000)

Event 150 (%226)

EVENT NAME: CSDRIVER
DESCRIPTION:

CALLING MODULE: BSCLCM

CALLING PROCEDURE: CSDRIVER

| PARAMETERS | PARAMETER DESCRIPTION | |
|---|---|---|
| P1 | TIMER | LSW |
| P2 | CURRENTSTATE | WHERE THE DRIVER IS IN THE STATE TRANSITION TABLE |
| P3 | CURRENTEVENT | (0:8) = CURRENT EVENT<br>(8:8) = LOGICAL DEVICE<br>WHAT CAUSED THE DRIVER TO BECOME ACTIVE |

Event 152 (%230)

EVENT NAME: CCONTROL
DESCRIPTION

CALLING MODULE: COMSYS5

CALLING PROCEDURE: CCONTROL

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1 | (0:8) = CS ERROR CODE<br>(8:8) = LOGICAL DEVICE NUMBER |
| P2 | CONTROL CODE |
| P3 | PARAMETER |

Event 153 (X231)

EVENT NAME: COPENTRACEFILE
DESCRIPTION:

CALLING MODULE:

CALLING PROCEDURE: COPENTRACEFILE

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1 | (0:8) = CS ERROR CODE<br>(8:8) = LOGICAL DEVICE NUMBER |
| P2 | CTRACEINFO |
| P3 | 0 |

Event 154 (X232)

EVENT NAME: CCLOSETRACEFILE
DESCRIPTION:

CALLING MODULE:

CALLING PROCEDURE: CCLOSETRACEFILE

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1 | (0:8) = CS ERROR CODE<br>(8:8) = LOGICAL DEVICE NUMBER |
| P2 | 0 |
| P3 | 0 |





Event 155 (X233)

EVENT NAME: CPOLLIST
DESCRIPTION:

CALLING MODULE:

CALLING PROCEDURE: CPOLLIST

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1 | LOGICAL DEVICE |
| P2 | CS ERROR CODE |
| P3 | PMAP |





MMSTAT Event Group 16

Event 160 (X240)

EVENT NAME: CREAD
DESCRIPTION:

CALLING MODULE: DSMON

CALLING PROCEDURE:

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= | TIME STAMP |
| P2= | (0:4) NOT USED<br>(4:1) BLOCK<br>(5:2) STATE<br>(7:3) NEXT<br>(10:1) :=0 INITIALIZATION EVENT<br>:=1 COMPLETION EVENT<br>(11:5) SUB EVENT NUMBER |
| P3= | DEPENDS ON THE SUB EVENT NUMBER AND IF IT IS AN INITIALIZATION OR COMPLETION EVENT.<br>MSG: (0:4) STRMTYPX<br>(4:6) MSG CLS<br>(10:16) STRMTYP |

| SUB EVENT NO. | SUB EVENT NAME | INIT PARM | COMP PARM |
|---|---|---|---|
| 0 | CREAD | 0 | LEN |
| 1 | CWRITE | X MSG | LEN |
| 2 | IOWAIT | 0 | LEN |
| 3 | CCHECK | 0 | ERRCOD |
| 4 | DSATTN | 0 | 0 |
| 5 | DSWC | W MSG | R MSG |
| 6 | CHNGEWAIT | PARM | 0 |
| 7 | MONREQ | REQ | 0 |
| 10 | CABORT | 0 | T/F |
| 11 | CRESET | 0 | 0 |
| 12 | CSDATA | R MSG | |
| 13 | CSREREAD | | |





MMSTRT Event Group 19

Event 191 (X277)

EVENT NAME: DISKINTRPT
DESCRIPTION: A 7905/7920 CONTROLLER IS PROCESSING AN ATTENTION INTERRUPT (ONLINE/OFFLINE)
CALLING MODULE: HARDRES

CALLING PROCEDURE: SIGDM

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= @DITP | (US)--i.e. WHO GOT THE INTERRUPT |
| P2= @DITP | (THEM)--i.e. WHO RAN THE POLL PROGRAM |
| P3= DITP | "OUR" DIT FLAGS WORD |

THERE SHOULD BE AT LEAST AN X300 AND AN X303 FOR EACH SID PRGM. A SINGLE ISOLATED (IN TIME) REQUEST WILL GENERATE AT LEAST A X303, X300, X303. IF THE QUEUE OF IOQ'S ON A DIT NEVER EMPTIES, THERE WOULD BE ONE X300 AND ONE X303 PER SID PRGM.

Event 192 (%300)

EVENT NAME: GIPINTERRUPT
DESCRIPTION: INTERRUPT JUST PROCESSED

CALLING MODULE: NAMDRES

CALLING PROCEDURE: GIP

| PARAMETERS | | PARAMETER DESCRIPTION |
|---|---|---|
| P1 | = | LDEV |
| P2 | = | QUEUE ELEMENT WORD ENTRY INDEX |
| P3 | = | CONTENTS OF DIT WORD 0: THE FLAGS WORD |
| P4 | = | CHANNEL PROGRAM INSTRUCTION POINTER |
| P5 | = | CONTROLLER STATUS |
| P6 | = | LSW of a Return from TIMER |





Event 193 (%301)

EVENT NAME: STARTIO
DESCRIPTION: Issuing SIOP machine instruction.

CALLING MODULE: NAMORES

CALLING PROCEDURE: START'MPI8, STARTIO

| PARAMETERS | | PARAMETER DESCRIPTION |
|---|---|---|
| P1 | = | Absolute address of SIO program to start. |
| P2 | = | LDEV number |
| P3 | = | DAT number |
| P4 | = | D'ENTRY'INDEX FROM DITP(DIDQP) |
| P5 | = | DIT WORD 0: THE DIT FLAGS WORD |
| P6 | = | LSW of R RETURN FROM A CALL TO TIMER |





Event 194 (%302)

EVENT NAME: SIOOM-ENTRY
DESCRIPTION: Entering SIOOM

CALLING MODULE: NAADAES

CALLING PROCEDURE: SIOOM

| PARAMETERS | | PARAMETER DESCRIPTION |
|---|---|---|
| P1 | = | LDEV |
| P2 | = | IOQ OR ORQ table relative index |
| P3 | = | DIT WORD 0 (DIT FLAGS) |
| P4 | = | CURRENT STATE OF THE VARIABLE STATE IN SIOOM |
| P5 | = | UNUSED AT THIS TIME |
| P6 | = | LSW RETURNED BY CALL TO TIMER |

Event 195 (%303)

EVENT NAME: SIOOM-EXIT
DESCRIPTION: Leaving SIOOM main loop.

CALLING MODULE: NAMORES

CALLING PROCEDURE: SIOOM

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|

SAME AS EVENT 194 (%302)
EXCEPT THAT EVENT IS 195 (%303)





MMSTAT Event Group 20

THESE EVENTS ARE FOR DEVELOPMENT USE ONLY AND ARE NOT NORMALLY ENABLED

Event 200 (%310)

EVENT NAME: DISKBUGCATCHER
DESCRIPTION: A MOUNTED VOLUME TABLE CHANGE IS BEING MADE.

CALLING MODULE: PVSYS

CALLING PROCEDURE: MVTABLE

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FUNCT | 0 = DELETE ENTRY<br>1 = ADD ENTRY<br>2 = PRESERVE ENTRY |
| P2= MVTABX (MOUNTED VOLUME TABLE INDEX) | |
| P3= DELTAP (VALUE OF Q-2) | |

Event 201 (%311)

EVENT NAME: DISKBUGCRTCHER
DESCRIPTION: A PRIVATE VOLUME USER TABLE CHANGE IS BEING MADE.

CALLING MODULE: PVSYS

CALLING PROCEDURE: USERTABLE

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1= FUNCT | 0 = CREATE USER ENTRY<br>1 = REMOVE USER ENTRY<br>2 = RETURN ALL MVTABX INDICES USED BY A SPECIFIC PCB<br>3 = RETURN ALL PCB POINTERS USING A SPECIFIC MVTABX<br>4 = GET USER ENTRY |
| P2= MVTABX (MOUNTED VOLUME TABLE INDEX) | |
| P3= DELTAP (VALUE OF Q-2) | |

MMSTAT Event Group 21 Process Creations and Terminations Logical Process Table

Event -211 (X323)

EVENT NAME: PROCESS COMPLETION
DESCRIPTION: PROCESS NRS TERMINATED

CRLLING MODULE: MORGUE

CRLLING PROCEDURE: TERMINRTE

PARAMETERS PARAMETER DESCRIPTION

P1=0
P2=0
P3=0





MMSTAT Event Group 22

Time Stamp of Event Trace Enable and Disable

Event 221 (X335)

EVENT NAME: CONFIGURRTION INFORMATION
DESCRIPTION: EVENT GROUP MASK

CRLLING MODULE: CRIO

CRLLING PROCEDURE: CONSMON

PRRAMETERS PARAMETER DESCRIPTION

P1= MERSMSK0

P2= MERSMSK1

P3=Reserved





Event 222 (X336)

EVENT NAME: CONFIGURATION INFORMATION
DESCRIPTION: MPE VERSION FIX UPDATE

CRLLING MODULE: OPCOMMAND

CALLING PROCEDURE: CXMON

PARAMETERS PARAMETER DESCRIPTION

P1= VERSION

P2= FIXL

P3= UPDATEL

Event -223 (-X337)

EVENT NRME: CONFIGURATION INFORMATION
OESCRIPTION: $YSTEM TRBLE LOCRTIONS RND AVRILABLE LINKEO MEMORY INFORMATION
CALLING MODULE: OPCOMMAND

CRLLING PROCEDURE: CXMON

PARRMETERS PRRRMETER DESCRIPTION

P1=F (X1032)=@CST(0)-@OST(0)
=DISPLACEMENT TO CODE
P2=F(X1033)=@CST(LAST)-@DST(0)
=DISPLACEMENT TO SNRRABLE
P3=LOGICRL(TOTRL&DLSK(4))=LINKEO MEMORY SIZE





Event -224 -(X340)

EVENT NAME: SYSPINS
DESCRIPTION: LOGICRL PROCESS TRBLE

CRLLING MODULE: OPCOMMAND

CALLING PROCEDURE: CXMON

PARAMETERS PARAMETER OESCRIPTION

P1=ABSOLUTE(X1141)=PROGEN'S PCBENTRY NUMBER
P2=RBSOLUTE(X1142)=NAM'S PCB ENTRY NUMBER
P3=ABSOLUTE(X1143)=UCOP'S PCB ENTRY NUMBER

Event -225 (-X341)

EVENT NAME: SYSPINS(CNTO.)
DESCRIPTION: LOGICRL PROCESS TABLE

CRLLING MODULE: OPCOMMAND

CALLING PROCEDURE: CXMON

PARAMETERS PARRMETER DESCRIPTION

P1=ABSOLUTE(X1144)=PFRIL'S PCB ENTAY NUMBER
P2=ABSOLUTE(X1145)=DEVREC'S PCB ENTRY #
P3=ABSOLUTE(X1146)=PRMSG'S PCB ENTRY #

Event -226 (-X342)

EVENT NRME: SYSPINS(CNTO.)
OESCRIPTION: LOGICRL PROCESS TRBLE

CRLLING MODULE: OPCOMMAND

CRLLING PROCEDURE: CXMON

PRRRMETERS PARAMETER OESCRIPTION

P1=ABSOLUTE(X1147)=STMSG'S PCB ENTRY #
P2=ABSOLUTE(X1150)=LOG'S PCB ENTRY #
P3=ABSOLUTE(X1151)=LORO'S PCB ENTRY N

Event -227 (-X343)

EVENT NAME: SYSPINS(CNTO.)
DESCRIPTION: LOGICAL PROCESS TABLE

CALLING MODULE: OPCOMMAND

CALLING PROCEDURE: CXMON

PARAMETERS PARAMETER DESCRIPTION

P1=ABSOLUTE(X1152)=IOMESSPROC'S PCB ENTAY #
P2=ABSOLUTE(X1153)=SYSIOPROC'S PCB ENTRY #
P3=ABSOLUTE(X1154)=MEMLOGP'S PCB ENTRY #

Event -228 (X344)

EVENT NAME: TIMESTRMP
DESCRIPTION: TIMESTRMP

CALLING MODULE: OPCOMMAND

CALLING PROCEDURE: CXMON

PARAMETERS PARAMETER DESCRIPTION

P1=CALENDAR (0:7)=YEAR OF CENTURY
(7:9)=DAY OF YEAR
P2=CLOCK(WORD1).(0:7)=HOUR OF DAY
(8:8)=MINUTE OF HOUR
P3=CLOCK(WORD2).(0:7)=SECONDS INTO MINUTE
.(8:8)=TENTHS OF SECONDS

Event -229 (-X345)

EVENT NAME: MONOFF
DESCRIPTION: END EVENT TRACING

CALLING MODULE: OPCOMMAND

CALLING PROCEDURE: CXMON

PARAMETERS PARAMETER DESCRIPTION

P1=0
P2=0
P3=0





MMSTAT Event Group 23 (Terminal I/O)

Event 230 (X346)

EVENT NAME: TERMREAD
DESCRIPTION: TERMINAL READ COMPLETION

CALLING MODULE: HARDRES
CALLING PROCEDURE: TIP

PARAMETERS PARAMETER DESCRIPTION

P1 = LDEV
P2 = READ DURATION
P3 = BYTES READ

Event 231 (X347)

EVENT NAME: DC1DC2ACK
DESCRIPTION: DC1/DC2 HAS BEEN SATISFIED

CALLING MODULE: HARDRES
CALLING PROCEDURE: TIP

PARAMETERS PARAMETER DESCRIPTION

P1 = LDEV
P2 = DURATION (BETWEEN START AND DC2)
P3 = BYTES READ (EXCLUDING DC2)





Event 232 (X350)

EVENT NAME: TERMWRITE
DESCRIPTION: WRITE COMPLETION

CALLING MODULE: IOTERMD
CALLING PROCEDURE: TERMIOM

PARAMETERS PARAMETER DESCRIPTION

P1 = LDEV
P2 = 0
P3 = BYTE COUNT OF TRANSFER

Event 233 (X351)

EVENT NAME: BINAREAD
DESCRIPTION: BINARY READ COMPLETED

CALLING MODULE: HARDRES
CALLING PROCEDURE: TIP

PARAMETERS PARAMETER DESCRIPTION
P1 = LDEV
P2 = DURATION
P3 = BYTES READ





Event 234 (X352)

EVENT NAME: TERMLOGON
DESCRIPTION: TERMINAL JUST LOGGING ON

CALLING MODULE: IOTERMD
CALLING PROCEDURE: TERMIOM

PARAMETERS PARAMETER DESCRIPTION
P1 = LDEV
P2 = 0
P3 = 0

Event 235 (X353)

EVENT NAME: TERMLOGOFF
DESCRIPTION: TERMINAL JUST LOGGED OFF

CALLING MODULE: IOTERMD
CALLING PROCEDURE: TERMIOM

PARAMETERS PARAMETER DESCRIPTION
P1 = LDEV
P2 = 0
P3 = 0

Event 236 (X354)

EVENT NAME: SPECCHAR
DESCRIPTION: PROCESSED SPECIAL CHARACTER

CALLING MODULE: HARDRES
CALLING PROCEDURE: TIP

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1 = LDEV | |
| P2 = SPECIAL CHARACTER PROCESSED | |
| P3 = 0 | |

Event 237 (X355)

EVENT NAME: BREAK
DESCRIPTION: PROCESSED BREAK

CALLING MODULE: HARDRES
CALLING PROCEDURE: TIP

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1 = LDEV | |
| P2 = DSTATE | |
| P3 = 0 | |

Event 238 (X356)

EVENT NAME: SPECREAD
DESCRIPTION: SPECIAL READ TERMINATION CHARACTER DETECTED

CALLING MODULE: HARDRES
CALLING PROCEDURE: TIP

| PARAMETERS | PARAMETER DESCRIPTION |
|---|---|
| P1 = LDEV | |
| P2 = DURATION | |
| P3 = BCNT | |





MMSTAT Event Group 24 (Power Fail)

Event 240 (X360)

Event Name: PFAIL
Description: Power fail detected.
Calling Module: ININ, PFAIL
Calling Procedures: Powerup (ININ), Powerup (PFAIL)

Parameter Description
---

P1 = 0 Called from Powerup in ININ
1 Called from entry in Powerup in PFAIL
2 Called from end of Powerup in PFAIL

P2 = For P1=0 this is 0
For P1=1,2:
TRUE = Multiple powerfail
FALSE= First powerfail

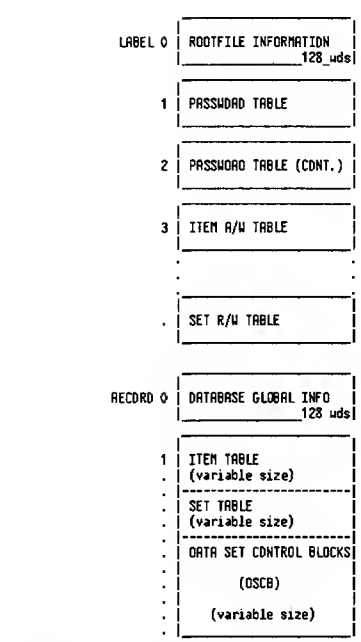
P3 = PF
0 = No powerfail or PFAIL processing complete
1 = Set by the power down trap in ININ
2 = Set by the power up trap in ININ
3 = Set when awake the PFAIL process
4 = Set by PFAIL after message appears on console

P4 = SYSUP
0 = System not back up after powerfail
1 = System back up after powerfail

P5,P6 not used.

# CHAPTER 21 ADDTFILE LAYOUT

## General Rootfile Layout




The data base RDDT FILE is an MPE file with filecode equal to -400. The record size is 128 words, fixed, binary format with a blocking factor of 1. The size of the file depends on the number of data items and data sets defined in the data base.





## Root File Label 0

| | | | % |
|---|---|---|---|
| WORD 0 | AL'CONDITION | (rootfile condition) | 0 |
| 1 | AL'DATE | (creation date) | 1 |
| 2 | AL'TIME | (creation time) | 2 |
| 3 | | | 3 |
| 4 | AL'EVEROPEN | | 4 |
| 5 | AL'COLDLOADID | (cold load id) | 5 |
| 6 | AL'USEACOUNT | | 6 |
| 7 | AL'DBCBDSTNUM | (DST number of DBCB) | 7 |
| 8 | AL'LOGID | (log id for transaction logging) | 10 |
| . | | | . |
| . | | | . |
| 11 | | | 13 |
| 12 | AL'LOGPASS | (log id password) | 14 |
| . | | | . |
| . | | | . |
| 15 | | | 17 |
| 16 | AL'FLAGS | (database flags) | 20 |
| 17 | AL'STORDATE | (DBSTORE date) | 21 |
| 18 | AL'STORTIME | (DBSTORE time) | 22 |
| 19 | | | 23 |
| 20 | AL'BUFSPECCOUNT | (buffer spec count) | 24 |
| 21 | AL'ILRCREATEDATE | (date ILR log created) | 25 |
| 22 | AL'ILRCREATETIME | (time ILR log created) | 26 |
| 23 | | | 27 |
| 24 | AL'ILRLASTDATE | (last log access date) | 30 |
| 25 | AL'ILRLASTTIME | (last log access time) | 31 |
| 26 | | | 32 |
| 27 | RESERVED FOR FUTURE USE | | 33 |
| . . | | | . . |
| . . | | | . . |
| 63 | | | 77 |
| 64 | AL'MAINTWORD | (database maintenance word) | 100 |
| . | | | . |
| . | | | . |
| 67 | | | 103 |
| 68 | AL'BUFFERSPECS | (buffer specifications) | 104 |
| | | | . |
| to | | | . |
| | | | . |
| 127 | | | 177 |

AL'CONDITION (IN ASCII):
- JB - Virgin. The database has not been created yet.
- FW - OK. The database is OK.
- RM - Modified deferred. The database is being modified.
- MC - Maintenance create. The database is being created.
- ME - Maintenance erase. The database is being erased.
- IL - ILR recovery in progress.





## Root File Label 0 (cont.)

AL'DATE: Root File creation date*. Its format is:

| 0:1 | 1:2 | 2:3 | 3:4 | 4:5 | 5:6 | 6:7 | 7:8 | 8:9 | 10:11 | 12:13 | 14:15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| year | | | | | | day_of_year | | | | | |

AL'TIME: Root File creation time*. Its format is:

| 0:1 | 1:2 | 2:3 | 3:4 | 4:5 | 5:6 | 6:7 | 7:8 | 8:9 | 10:11 | 12:13 | 14:15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| hour | | | | | | minutes | | | | | |
| seconds | | | | | | tenth_of_seconds | | | | | |

AL'EVEROPEN: This field is no longer used under IMAGE B

AL'FLAGS:
- (0:1) - RECOVERY Default is NO (0)
- (1:1) - LOGGING Default is NO (0)
- (2:1) - ACCESS Default is YES (1)
- (3:1) - DUMPING Default is NO (0)
- (4:1) - RESERVED-FOR-FUTURE-USE
- (5:2) - SUBSYSTEM ACCESS Default is R/W (00)
- (7:1) - ILR Default is NO (0)
- (8:2) - RESERVED-FOR-FUTURE-USE
- (10:1)- DIRTY FLAG Default is YES (1). This indicates the database has been modified but not DBSTORED.
- (11:5)- RESERVED-FOR-FUTURE-USE

AL'STORDATE: Same format as AL'DATE*.

AL'STORTIME: Same format as AL'TIME*.

AL'BUFSPECCOUNT: Maximum number of buffer specifications allowed.

AL'ILRCREATEDATE: Same format as AL'DATE*.

AL'ILRCREATETIME: Same format as AL'TIME*.

AL'ILRLASTDATE: Same format as RL'DATE*.

AL'ILRLASTTIME: Same format as RL'TIME*.

AL'MAINTWORD: For data bases with no maintenance word this field has 2 semicolons (';;') and trailing blanks.



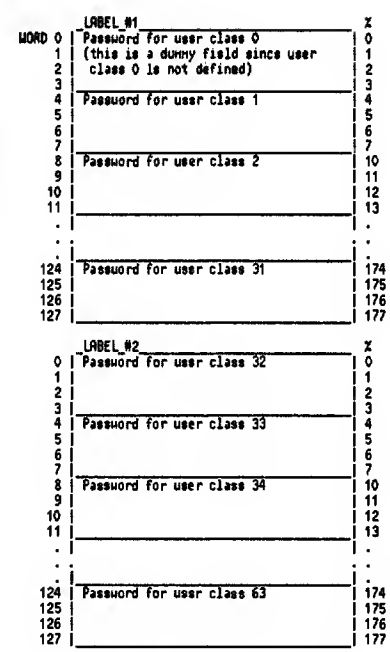


AL'BUFFSPECS:

| BIT/ WD | 0:1 | 1:2 | 2:3 | 3:4 | 4:5 | 5:6 | 6:7 | 7:8 | 8:9 | 10:11 | 12:13 | 14:15 | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 68 | buffers_for_1 user | | | | | | buffers_for_2 users | | | | | | 104 |
| 69 | buffers_for_3 users | | | | | | buffers_for_4 users | | | | | | 105 |
| . | etc... | | | | | | | | | | | | . |
| . | | | | | | | | | | | | | . |
| 127 | buffers_for_119 users | | | | | | buffers_for_120 users | | | | | | 177 |

* The DATE and TIME fields can be formatted (for display purposes) individually by calling the FMTCALENDAR and FMTCLOCK Intrinsics respectively. Or both fields can be formatted at once with FMTDATE Intrinsic.

Root File Labels 1 & 2

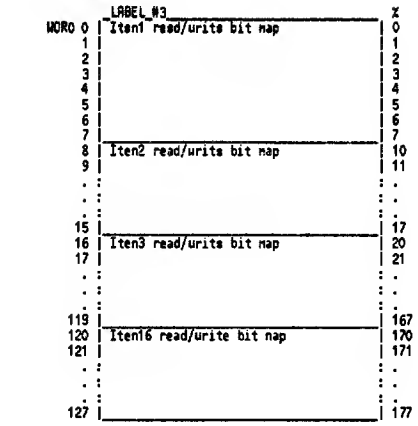



The PASSWORD TABLE occupies user labels number 1 and 2.
There are four words (8 characters) reserved for each password. The relative position of a password corresponds to the user class number defined in the schema. For user class numbers not defined in the SCHEMA, the four word field is filled with blanks.





Root File Label 3




The ITEM READ/WRITE TABLE starts in user label #3
There are eight words for each ITEM READ/WRITE bit map.
For databases with more than 16 items, the read/write table continues in the next user labels. The specific format of this table is explained after the SET READ/WRITE TABLE since it is defined the same way.
The number of user labels occupied by the ITEM READ/WRITE TABLE depends on the number of data items defined in the schema and can be obtained by rounding upwards (ceiling)the result of:

Num-of-labels = [(Num-of-items)*8]/128

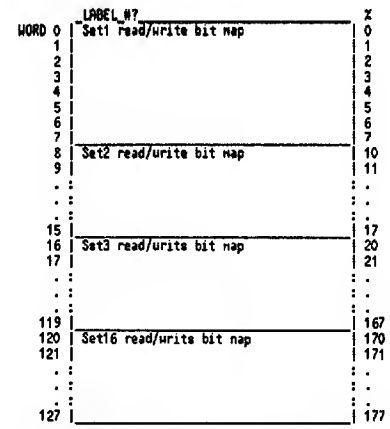
Since there can only be a maximum of 255 data items in the schema, the maximum size for this table in user labels would be:

Max-size = [(255)*8]/128 = 15.93 => 16 labels.





Root File- Next Label




The SET READ/WRITE TABLE starts on a user label boundary after the ITEM READ/WRITE TABLE.
There are eight words for each SET READ/WRITE bit map.
For databases with more than 16 data sets, the read/write table continues in the next user labels.
The specific format of this table is shown in the next page.

The number of user labels occupied by the SET READ/WRITE TABLE depends in the number of data sets defined in the schema, and is obtained by rounding upwards (ceiling) the result of:

Num-of-labels = [(Num-of-sets)*8]/128

Since there can only be a maximum of 99 data sets defined in the schema the maximum size for this table in user labels is:

Max-size = [(99)*8]/128 = 6.18 => 7 labels

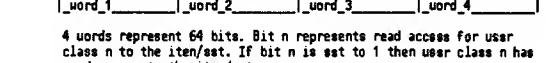




Item/Set Read/Write Table Format

There are eight words per item/set read/write table definition and up to 16 items/sets per record (user label). Within each 8 words, the first 4 words are the flags for the user classes which have read access to the item/set. The second 4 words are the flags for the user classes which have write access to the item/set. The detail format for an eight word field is shown below.

A. Four words for read access:

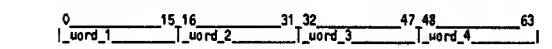



4 words represent 64 bits. Bit n represents read access for user class n to the item/set. If bit n is set to 1 then user class n has read access to the item/set.
For example, if the word settings are:

| word 1 | word 2 | word 3 | word 4 |
|---|---|---|---|
| %000016 | %020000 | %000410 | %001300 |

This means that user classes 12, 13, 14, 18, 39, 44, 54, 56 and 57 have read access to the item/set.
If no read/write security is defined at all for the item/set, then all of the read security bits are set to 1.

B. Four words for write access:




Write access flags have the same format as the read access flags. Bit n represents write access for user class n to the item/set. If bit n is set to 1, then user class n has write access to the item/set
For example, if the word settings are:

| word 1 | word 2 | word 3 | word 4 |
|---|---|---|---|
| %000010 | %020000 | %000000 | %001100 |

This means that the user classes 12, 18, 54 and 57 have write access to the item/set.
If no read/write security is defined at all for the item/set, then all of the write security bits are set to 0.

Root File Record 0

```
        _RECOAD #0_____________________________________ %
 word 0 |ADDT'DBSTATUS_____________________________| 0
      1 | ADDT'DBNAME                              | 1
      2 |                                          | 2
      3 |                                          | 3
      4 |__________________________________________| 4
      5 |RDDT'TRLRLGTH___(trailer_area_length)_____| 5
      6 |RDDT'BUFFLGTH___(buffer_length)___________| 6
      7 |RDDT'LGTH_______(rootfile_length)_________| 7
      8 |RDDT'ITEMCT_____(number_of_items)_________| 10
      9 |RDDT'SETCT______(number_of_data_sets)_____| 11
     10 |RDDT'ITEMPTR____(item_table_pointer)______| 12
     11 |RDDT'DSETPTR____(set_table_pointer)_______| 13
     12 |RESERVED        (set to blanks)           | 14
     13 |                                          | 15
     14 |                                          | 16
     15 |__________________________________________| 17
     16 |NOWOPEN___________________________________| 20
     17 |MAXOPEN___________________________________| 21
     18 |RESERVED        (for future use)          | 22
      . :                 (set to binary 0s)        : .
      . :                                           : .
      . :                                           : .
    127 |__________________________________________| 177
```

ADDT'DBSTATUS
(0:8) - IMAGE version ('B' in ASCII)
(8:8) - Binary 1 (filler)

RODT'DBNAME - DATABASE name left justified (last 2 chars are blank).

NOWOPEN - Number of data sets opened. This field is not used in IMAGE B

MAXDPEN - Maximum number of data sets that can be opened. This field is not used in IMAGE B.

NOTE:
ROOT'ITEMPTR and RDDT'DSETPTR is a word offset from record 0 (beginning of the file, not including the space taken by the user labels) and can span several records.
These pointers point to the 0th entry of the table and since the 0th entry in the item table or the set table does not really exist, they actually point to 11 words before the beginning of the table. To get to the first entry in the table, this pointer should be incremented by the length of the entry (which is currently 11 words).





Root File Record 1

```
 bits/   _0:_1:_2:_3:_4:_5:_6:_7:_8:_9:10:11:12:13:14:15 %
 word 0 | item-name-1                                    | 0
      1 |                                               | 1
      2 |                                               | 2
      3 |                                               | 3
      4 |                                               | 4
      5 |                                               | 5
      6 |                                               | 6
      7 |_______________________________________________| 7
      8 |_item-no-of-synonym____|_reserved-1____________| 10
      9 |_reserved-2____________|_item-type_____________| 11
     10 |_subiten-count_________|_subiten-length________| 12
     11 | item-name-2                                   | 13
     12 |                                               | 14
     13 |                                               | 15
     14 |                                               | 16
     15 |                                               | 17
     16 |                                               | 20
     17 |                                               | 21
     18 |_______________________________________________| 22
     19 |_item-no-of-synonym____|_reserved-1____________| 23
     20 |_reserved-2____________|_item-type_____________| 24
     21 |_subiten-count_________|_subiten-length________| 25
     22 |                                               | 26
      . :                                              :
```

The ITEM TABLE starts in record #1.
Each entry is 11 words long and the length of the table depends on the number of data items defined in the schema. The relative position of an item definition depends on its relative position in the schema.

Item-name: is a data item name, left-justified and with trailing blanks

Item-number-of-synonym: is the number of the item whose name has the same hashed result as this one (this is utilized for quick item name searches).

Item-type: is one of the following: I, J, K, R, X, U, Z, or P

```
                item-type
                   |
       VALUES, 20J2;
               | |subiten-length
               |subiten-count
```

The maximum size for this table is 11*255 = 2805wds

NOTES:
The reserved-1 and reserved-2 fields are the 'old' level numbers for read and write security. Now, the values are always zero.





Root File- Next Record

```
 bits/   _0:_1:_2:_3:_4:_5:_6:_7:_8:_9:10:11:12:13:14:15 %
 word 0 | set-name-1                                     | 0
      1 |                                               | 1
      2 |                                               | 2
      3 |                                               | 3
      4 |                                               | 4
      5 |                                               | 5
      6 |                                               | 6
      7 |_______________________________________________| 7
      8 |_set-no-of-synonym_____|_reserved-1____________| 10
      9 |_reserved-2____________|_data-set-type_________| 11
     10 |_DSCB-pointer__________________________________| 12
     11 | set-name-2                                    | 13
     12 |                                               | 14
     13 |                                               | 15
     14 |                                               | 15
     15 |                                               | 17
     16 |                                               | 20
     17 |                                               | 21
     18 |_______________________________________________| 22
     19 |_set-no-of-synonym_____|_reserved-1____________| 23
     20 |_reserved-2____________|_data-set-type_________| 24
     21 |_DSCB-pointer__________________________________| 25
     22 |                                               | 26
      . :                                              :
      . :                                              :
      . :                                              :
```

Set table follows the Item table.

Each entry is 11 words long. The length of the table depends on the number of data sets defined in the schema. The relative position of a set definition depends on its relative position in the schema.

Set-name: is a data set name, left-justified and with trailing blanks.

Set-number-of-synonym: is the number of a data set whose name has the same hashed result as this one (this is utilized for quick set name searches).

Data-set-type is one of the following: A, M or D.

DSCB-pointer: is a pointer to the Data Set Control Block. This pointer is word offset from record #0. The DSCB is described ahead.

The maximum size for this table is 11*99 = 1089wds.

NOTES: The reserved-1 and reserved-2 fields are the 'old' level numbers for the read and write access respectively. Since this concept no longer applies, the values are set to zero.



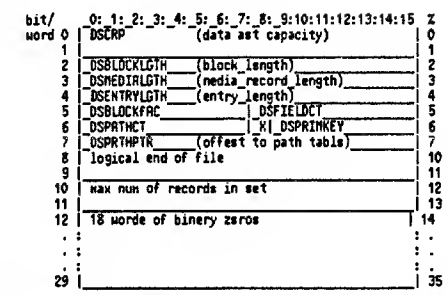


Data Set Control Blocks (DSCB)- General Layout

```
 _____________________________________________ ___
| DATA SET GLOBAL AREA (set 1)                |   }
|      (capacity, lengths, counts, etc.)      |   }
|                                  30 wds.    |   }
|_____________________________________________|   }
| RECORD DEFINITION TABLE (set 1)             |   }
|        a. ITEM NUMBERS                      |   } DSCB
|        b. ITEM DISPLACEMENT                 |   } set1
|                              fieldcount*2+2 |   }
|_____________________________________________|   }
| PATH TABLE (set 1)                          |   }
|      (search item, sort item, etc.)         |   }
|                                 pathcount*2 |   }
|_____________________________________________|___}
| DATA SET GLOBAL AREA (set 2)                |   }
|      (capacity, lengths, counts, etc)       |   }
|                                  30 wds.    |   }
|_____________________________________________|   }
| RECORD DEFINITION TABLE (set 2)             |   }
|        a. ITEM NUMBERS                      |   } DSCB
|        b. ITEM DISPLACEMENT                 |   } set2
|                              fieldcount*2+2 |   }
|_____________________________________________|   }
| PATH TABLE (set 2)                          |   }
|      (search item, sort item, etc.)         |   }
|                                 pathcount*2 |   }
|_____________________________________________|___}
|                                             |
:                                             :
:                                             :
:                                             :
|_____________________________________________|-
| DATA SET GLOBAL AREA (last set)             |   }
|      (capacity, lengths, counts, etc)       |   }
|                                  30 wds.    |   }
|_____________________________________________|   }
| RECORD DEFINITION TABLE (last set)          |   }
|        a. ITEM NUMBERS                      |   } DSCB
|        b. ITEM DISPLACEMENT                 |   } last set
|                              fieldcount*2+2 |   }
|_____________________________________________|   }
| PATH TABLE (last set)                       |   }
|      (search item, sort item, etc.)         |   }
|                                 pathcount*2 |   }
|_____________________________________________|___}
```

The DSCBs follow the SET TABLE in the Root File.
There is one DSCB for each data set defined. The function of the DSCB is to define each data set within the data base.

Data Set Control Block (Global Area)




DSCAP - data set capacity as reported by the SCHEMA processor.

DSBLOCKLGTH - data set block length including the bit map overhead.

DSMEDIRLGTH - data set media record length (remember that this length includes the pointer overhead)

DSENTRYLGTH - data set entry length.

DSBLOCKFAC - data set blocking factor.

DSFIELDCT - data set field count. This is the number of fields specified for the data set.

DSPATHCT - data set path count. This is the number of paths that are specified for the data set.

X-DSKEYTYPE - data set key type. If DSKEYTYPE = TRUE then the key is hashed.

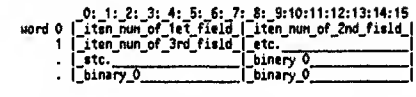
DSPRIMKEY - data set primary path or key.
For master data sets, this is the field number of the search item.
For detail data sets, this is the field number of the primary path.

DSPATHPTR - data set path table pointer. Word offset to the data set path table which contains an entry for each path defined. It points to path 0th entry in the table, so to get to the first entry the pointer should be incremented by the length of the entry (which is currently 2 words).



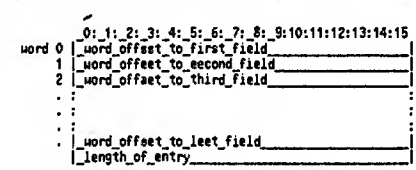


Data Set Control Block (Item Numbers)




The Item Numbers Table follows the Global Area of the DSCB. The size of this table (in words) is equal to the number of items in the given data set plus 1. The first n bytes are used to carry the item numbers of the fields within the data set. The remaining n+2 bytes are set to binary zeros.

Data Set Control Block (Record Definition Item Displacement)




This table immediately follows the Item Numbers Table.

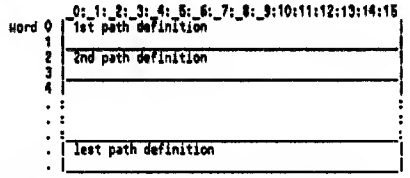
The word offset points to the starting location of the field within the media record. Remember that the media record includes the pointer overhead so this offset varies for master and detail data sets: if a master data set has only one path, the word offset for the first field is 10, since there are 10 words of overhead--5 words for the synonym chain pointers and 5 words for the data set chain head that it would be pointing to. On a detail data set with one path, the overhead is only 4 words.

The 'length-of-entry' field is the same as the media record length.





Data Set Control Block (Path Table)

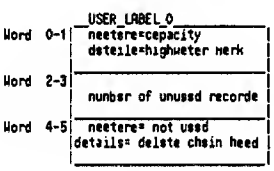



There are 2 words (4 bytes) for each path definition.
The PATH TABLE for master data sets has a different layout from the PATH TABLE for detail data sets.

Master sets:
Byte Description
1 - item number of the search item in the related detail set.
2 - item numbr of the sort item in the related detail set.
3 - set number of the related detail data set
4 - path number of the corresponding path in the related detail data set.

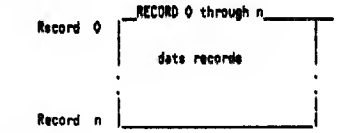
Detail sets:
Byte Description
1 - field number of the search item.
2 - field number of the sort item.
3 - set number of the related master data set
4 - path number of the corresponding path in the related master data set.

General Data Set Layout








Data Set User Label 0

Word 0-1: Record name of the highest readable record. For Masters, this is the highest record in the set (i.e. Capacity). For Details, this is the greatest number of records that have been written to the set thus far. For example, if there is room in the Detail data set for 100 records and 75 were written last week when the data set was loaded with DBLOAD, and yesterday 15 records were deleted from the data set, the "High Water Mark" is equal to a value of '75'.

Word 2-3: Number of unused records in the data set. This field is incremented when a record is deleted and decremented when a record is added. To determine the current number of entries used in the set subtract Word 1-2 (unused count) from Word 0-1 (capacity).

Word 4-5: The delete chain head for Details. This points to the record most recently deleted or contains a value of zero if no records have been deleted. This field is not used in Master data sets.

Data Set Records

The data in the data set records is arranged according to the Media records. These are formatted by the Schema Processor (DBSCHEMA).

# CHAPTER 22 DISC FREE SPACE MAP

## Disc Resident Data Structures

There are two disc resident free space data structures, the bit map and the descriptor table, for each disc volume that has a free space map, i.e. system discs and private volumes. The addresses of these data structures are kept in the disc label. The symbols that define the descriptor table and bit map are in the include file INCLDFS2.

### Bit Map

The bit map is divided up into pages, which is the physical block of the map that is read or written. At the moment, a page is defined to be one sector (128 words) long, this may be changed by changing a compile time constant. The last word of the page is a checksum for that page, all other words are data. There is a one to one correspondence between bits in the map and sectors of the disc. A one bit represents a free sector and a zero bit represents an allocated sector. The bit map is a contiguous set of pages, enough to represent the entire disc, excluding spare tracks and spare sectors.

### Descriptor Table (DT)

The descriptor table is an array of three word entries, one entry for each page of the bit map. Each entry looks like this:

```
            ====================
            =                  =
word 0   =  largest space      =
            =                  =
            ====================
            =                  =
word 1   =  starting space     =
            =                  =
            ====================
            =                  =
word 2   =  ending space       =
            =                  =
            ====================
```





Thus the descriptor table looks like this.

```
            ------------
=           =  entry for page 0
            ------------
=           =  entry for page 1
            ------------
=           =  entry for page 2
            ------------
=           =  entry for page 3
            ------------
                  .
                  .
                  .
            ------------
=           =  entry for last page
            ------------
```

Each entry describes the free space on the corresponding page of the bit map. The largest space word is the size of the largest contiguous block of free space on the page, which is not at the very beginning or very end of the page. That is, the first bit physically representing the space is not the first bit of data on the page or the last bit representing the space is not the last bit of data on the page. Starting space is the number sectors of contiguous space represented by the set of bits whose first bit is the first bit of data on the page. Ending space is the number of sectors of contiguous space represented by the set of bits whose last bit is the last bit of data on the page. The starting space and ending space fields allow looking across page boundaries, thus preventing fragmentation on page boundaries. Thus, if all sectors represented on a page are free, then starting and ending space will be the same and have the total number of free sectors represented on the page. Largest space will be zero, as there is no block of space that is not at the beginning or end of the page. A value of - 1 for all the fields in an entry indicates the corresponding page is bad, either from a checksum or I/O error.

## Virtual Memory Resident Data Structures

For each system disc or physically mounted private volume there is a data segment which has information about the disc free space map, the current copy of the descriptor table, some work space for the procedures while in split stack mode and buffers for pages of the bitmap. The DST number of the data segment for a given disc is found in the LDTX entry for that disc.

## Disc Free Space Data Segment

For each system disc or physically mounted private volume in the up and running system there is a DST which contains information about the disc free space map for that disc, some work area, a copy of the descriptor table and buffers for the pages of the bit map.





All symbols that define these data segments are in the include file INCLDFS1, and they are prefixed with "ds'". The structure of the data segment is as follows:

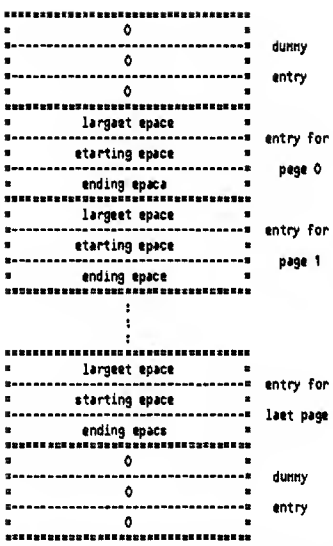
```
                ==================================
0 (%0)  =                ds'ldev                 =
                =----------------------------------=
1 (%1)  =                ds'dst                  =
                =----------------------------------=
2 (%2)  =                                        =
                =--------- ds'disc'size ----------=
3 (%3)  =                                        =
                =----------------------------------=
4 (%4)  =           ds'last'page'of'map          =
                =----------------------------------=
5 (%5)  =         ds'last'buffer'index           =
                =----------------------------------=
6 (%6)  =                                        =
                =-------- ds'map'address ---------=
7 (%7)  =                                        =
                =----------------------------------=
8 (%10) =                ds'lock                 =
                =----------------------------------=
9 (%11) =             ds'lock'count              =
                =----------------------------------=
10 (%12) =            ds'queue'head              =
                =----------------------------------=
11 (%13) =            ds'queue'tail              =
                =----------------------------------=
12 (%14) =          ds'descriptor'table          =
                =----------------------------------=
13 (%15) =         ds'buffer'page'number         =
                =----------------------------------=
14 (%16) =           ds'buffer'dirty             =
                =----------------------------------=
15 (%17) =           ds'buffer'area              =
                =----------------------------------=
16 (%18) =       ds'first'threshold'page         =
                =----------------------------------=
17 (%21) =                                       =
                =-- ds'size'of'last'allocation --=
18 (%22) =                                       =
                =----------------------------------=
```



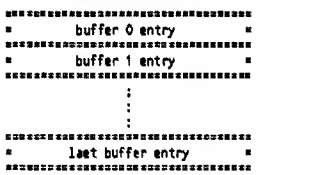


```
                =----------------------------------=
19 (%23) =   ds'last'page'allocated'from         =
                =----------------------------------=
20 (%24) =         ds'next'buffer'index          =
                =----------------------------------=
21 (%25) =             ds'page'number            =
                =----------------------------------=
22 (%26) =             ds'word'number            =
                =----------------------------------=
23 (%27) =              ds'bit'number            =
                =----------------------------------=
24 (%30) =             ds'page'pointer           =
                =----------------------------------=
25 (%31) =        ds'starting'word'number        =
                =----------------------------------=
26 (%32) =        ds'starting'bit'number         =
                =----------------------------------=
27 (%33) =                                       =
                =----- ds'number'of'sectors -----=
28 (%34) =                                       =
                =----------------------------------=
29 (%35) =              ds'bit'count             =
                =----------------------------------=
30 (%36) =              ds'entry'type            =
                =----------------------------------=
31 (%37) =             ds'buffer'index           =
                =----------------------------------=
32 (%40) =                                       =
                =-------- ds'disc'address --------=
33 (%41) =                                       =
                =----------------------------------=
34 (%42) =             ds'error'status           =
                =----------------------------------=
```

The rest of the data segment contains tables whose size and location is dependent on the size of the disc and or the number of buffers in the data segment. They are shown below just to demonstrate there relation to one another, for there actual location, the pointers should be examined. The symbol "ds'array'area" defines the start of the area. The first table is the descriptor table, it is in the same format as the disc copy, but a dummy entry of all zeros is added before and after the table, these are needed by procedures "Find'Page" and "Build'Descriptor'Entry". The pointer to this table is "ds'descriptor'table", it points to the entry for page zero, not the dummy entry.



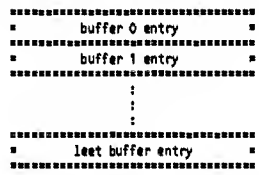

The next table is de'buffer'page'number table, it has a one word entry for each buffer in the data segment. Each entry contains the page number of the page currently in the corresponding buffer or -1 if the buffer is empty. This is pointed to by "de'buffer'page'number".



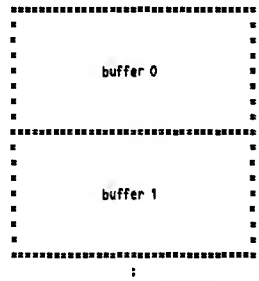





The next table is the de'buffer'dirty table, which has a one word entry for each buffer. A TRUE indicates the page in the corresponding buffer is dirty, i.e. the disc copy is not up-to-date. A FALSE indicates that the buffer is clean. If DFS was compiled with dirty buffer management turned off, this table is not present and the de'buffer'dirty pointer is zero.

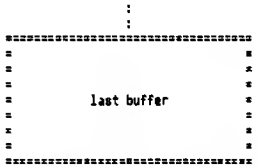



The remainder of the data segment contains the buffers, each buffer is the size of one page of the bit map, which is currently one sector(128 words). The beginning of the buffer area is pointed to by "de'buffer'area" and the number of buffers is the value in "de'last'buffer'index" plus one.








Each of the fields of the data segment is described in the include file INCLDFS1, where they are defined. It should be noted that the following fields are just workspace, used to pass information between procedures while in split stack mode and have no meaning between calls to the disc free space management subsystem:

| | |
|---|---|
| ds'page'number | ds'word'number |
| ds'bit'number | ds'page'ptr |
| ds'starting'word'number | ds'starting'bit'number |
| ds'number'of'sectors | ds'entry'type |
| ds'bit'count | ds'buffer'index |
| ds'disc'address | |

The field ds'error'status normally has no meaning between calls unless the error'type field has a value greater than "fatal'dfs'error", in which case it means that disc space may no longer be allocated on this disc.

# CHAPTER 23 MPE DISC CACHING

## Disc Caching Overview

Disc Caching is an optional feature of MPE that utilizes excess main memory and excess CPU horsepower to keep portions of frequently referenced disc "domains" in memory. (A disc "domain" is a copy of a portion of disc residing in main memory. These disc domains are considered "cached" when they are in memory and are considered "mapped" when there is I/O pending against them.) Disc Caching manages the bi-directional transfer of these disc domains between main memory and disc storage. No main memory is permanently dedicated to cached disc domains. Cached disc domains share main memory with all other types of MPE segments and are not treated differently by the memory manager. By keeping cached disc domains in memory, a significant portion of the references to disc storage can be resolved without actually having to physically access the disc. Disc Caching policies are integrated into the MPE Kernel, File System, and I/O System which allows the system performance to be tuned based on the current workload and resource availability.

Disc Caching uses the MPE kernel resource management mechanisms and strategies. These mechanisms are extended to handle cached disc domains in the same manner as segments. Thus, cached disc domains can be of variable size, fetched in parallel with other segments or cached domains, garbage collected, and replaced in the same manner as stacks, data and code segments. The relative use of main memory between stacks, data and code segments, and cached disc domains is dynamic. This partitioning is based on the workload's current requirements and current memory availability.

Disc Caching can be enabled/disabled on a disc by disc basis. When caching is enabled for the first disc, the code segment containing the Disc Caching code will be locked into memory. Also at this time the Cache Directory Table (CDT) will be built and locked into memory. When caching is disabled for the last disc, the code segment will be unlocked from memory and the CDT will be released. Thus if caching is not enabled no memory will be wasted.

The CDT is used to keep track of the following information:

1) The disc ldevs currently enabled for caching. There will be a Device Entry in the table for each cached disc.

2) A linked list of cached domains for each disc with caching enabled. The head and tail of this linked list will be contained in the Device Entry. (I.e. there is a separate linked list of cached domains for each cached disc ldev.)

3) The cached domains that currently have user I/O pending (i.e. FREADS/FWRITES) or have memory management I/O pending (i.e. fetching the disc domain into memory, or posting the disc domain back out to disc). There will be a Mapped Domain Entry in the table for each disc domain has that I/O pending and is thus "mapped".





4) A linked list of all user I/O pending against the mapped disc domains. There will be a Logical Disc Request (LDR) queued to the Mapped Domain entries that will describe the user I/O to take place. This is analogous to a Disc Request queued to a specific DIT waiting for service.

When a request is made to access disc information, Disc Caching must first determine if the requested disc domain is present in memory. Disc Caching will first determine if the requested area of disc is already mapped into memory by scanning through the Mapped Domain entries of the CDT. If the requested transfer can be satisfied with a currently mapped disc domain, then the I/O request will be queued (FIFO) behind the other I/Os pending against that mapped domain. If the requested area is not already mapped, then a search is made through the linked list of cached disc domains for the specified disc ldev. (The region header contains the disc address and size that a disc domain represents.) If the requested domain is found in this list (i.e. present in memory), then this region will be mapped. R domain is then considered mapped when there is an entry for it in the Mapped Domain portion of the CDT. Mapping the domain allows Disc Caching to manage the I/O pending and/or currently active for a particular disc domain. Once the disc domain is mapped and present, the data can be moved between the process' data area and the mapped disc domain. The process can then continue executing without interruption or a process switch. The user/subsystem process for which the move is done will be charged with the CPU overhead.

When a request is made to read data that is not currently cached in memory (i.e. a read "miss"), the fetch strategy uses the File System's knowledge of the type of access (sequential or random), the extent size of the file, along with the current memory load to select the optimal size of the disc domain to be fetched and mapped into memory. The fetch of the disc domain is then initiated on the user's stack without a process switch. After the fetch is initiated, it completes in an unblocked manner so that this process (if no-wait I/O) or another process can proceed in parallel with the cache fetch.

In general, when writing, a process will not wait for completion of the physical I/O. Instead, the process will be awakened as soon as the transfer has completed between the process's data area and the mapped disc domain (i.e. no-wait-for-post). The physical I/O will then be posted at background priority while the process continues. (Users can specify wait-for-post on a file by file basis in place of the default no-wait-for-post with the FSETMODE intrinsic. This can be done on a global basis via :CACHECONTROL.) If the access request is a write and there is a current write pending against the specified mapped disc domain, the process request is queued until the pending write is posted to disc. If the disc domain to be written is not currently cached in memory, a free piece of memory will be obtained to map the corresponding disc image and then the "write" takes place from the process' data area to the mapped disc domain. This prevents data from having to be read before being written. After that, a post to disc is initiated (on any write only the portion of a mapped disc domain that is modified will be posted to disc). After the move to the mapped disc domain is complete and the post to disc is initiated, the process performing the "write" is allowed to continue to run without having to wait for the post to complete. Writes that must be posted to disc in a certain order use the Global Serial Write Queue. These





ordered writes include things like updating disc free space maps for a new file extent before updating the file extent map in the file label.

There are two disc request entries used for disc caching requests. The first entry is a Logical Disc Request (LDR) entry and is used to manage the data moves to/from the user's data area and the disc domain (i.e. the logical I/O). The second entry is a regular Disc Request (DRQ) entry and is used to perform the physical I/O necessary to map a disc domain (for a read "miss") or to perform the physical post (on write requests). The disc domain will remain mapped until both the logical and physical I/O completes. If a request is not completely described by one disc domain already in memory or a Mapped Domain CDT entry (i.e. the requested disc area falls into more than one disc domain) then the overlapping disc domain(s) will be flushed to disc and the new complete disc domain will be fetched (if read) and mapped - no partial mappings are allowed.

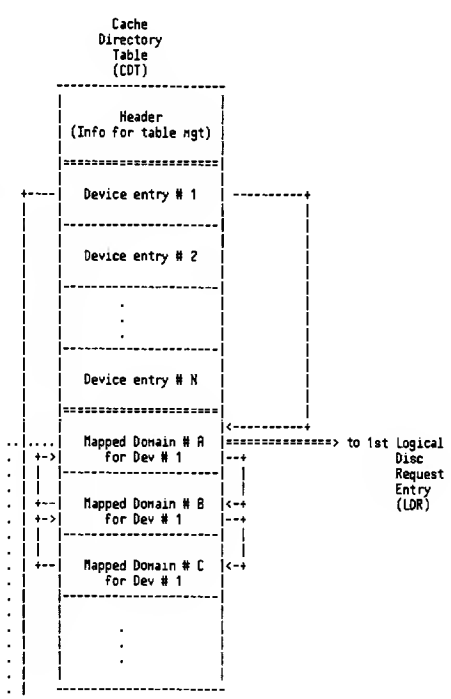
The DST number of the Cache Directory Table (CDT) is at %1273 and the bank and offset are kept in %1274-%1275. The Caching Sir (2) is used when starting and stopping caching (via :STRRTCACHE/:STOPCACHE) and by the LORDER when loading a program file (this sir is only used when updating the STT at load time).

When caching is enabled for a disc, a bit in the flags word of the DIT is set. Also, the Global Serial Write queue can be found by examining the header entry of the Disc Request Table. See Chapter 13 for a more detailed explanation of both the DIT and the Disc Request Table header. See Chapter 2 for a description of the Memory Region Header for a disc domain (cached region).

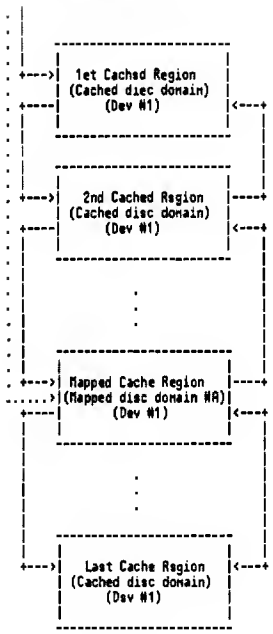




## Disc Caching Tables Overview



Memory Regions








Cache Directory Table

The Cache Directory Table (CDT) is the bookkeeping structure for managing cached disc domains. This table is divided into 3 parts:

CDT Header Entry
This entry contains all information necessary to manage the entire table and also contains global caching related information.

CDT Device Entry
There will be one of these entries for every disc ldev that currently has caching enabled. These entries keep track of all cached disc domains in memory for this device. In addition, these entries contain statistics regarding the number of I/Os performed to the ldev.

CDT Mapped Domain Entry
These entries describe disc domains that are currently "mapped" into memory. This means that there is logical I/O (cache move) and/or physical I/O (fetch or post) pending. These entries keep track of the state of the cached disc domain (IMI, RDC, etc.) just as the DST Table keeps track of data segments.

The following low core calls contain the address of the CDT:

X1273 contains the DST Number of the CDT
X1274 contains the Bank Number of the CDT
X1275 contains the Offset within the bank of the CDT





Header Entry

| | | |
|---|---|---|
| 0 | # Entries | CDT'ENTRIES |
| 1 | Entry Size (X30) | CDT'SIZE |
| 2 | # Free Entries | CDT'FREE'COUNT |
| 3 | 1st free Entry (table offset) | CDT'FREE'HEAD |
| 4 | Last free Entry (table offset) | CDT'FREE'TAIL |
| 5 | Max # Entries Used | CDT'MAX'USED |
| 6 | # Ldevs cached | CDT'NUM'LDEVS |
| 7 | 1st Cache device entry (entry number) | CDT'DISC'HEAD |
| X10 | # Words this DST | CDT'DST'WORDS |
| X11 | TRUE if stopcache pending | CDT'STOP'PND |
| X12 | # Sectors sequential fetch | CDT'SEQ'MINFTCH |
| X13 | # Sectors random fetch | CDT'RND'MINFTCH |
| X14 | TRUE if wait for physical post | CDT'FORCE'POST |
| X15 | Head of impeded queue (PIN) | CDT'STOP'QUEUE |
| X16 | . . . | |
| X27 | | |





CDT'ENTRIES
The total number of CDT entries configured in this table (i.e. includes all three types of entries). The number of entries in the table will be:
1 entry for the header
+ 1 entry for each disc ldev configured.
(CDT Device entries)
+ 1 entry for each DRQ configured.
(CDT Mapped Domain entries)

This scheme insures that this table can never overflow (since an entry in the DRQ table is always obtained before an entry in this table).

CDT'SIZE
Size of each entry in the table.

CDT'FREE'COUNT
Total number of entries currently unassigned.

CDT'FREE'HEAD
Table relative offset (i.e. Entry number * entry size) of the first available entry.

CDT'FREE'TAIL
Table relative offset of the last available entry.

CDT'MAX'USED
The maximum number of entries in use at one time.

CDT'NUM'LDEVS
The number of ldevs currently cached.

CDT'DISC'HEAD
The entry number of the first Device Entry.

CDT'DST'WORDS
The total number of words in this data segment.

CDT'STOP'PND
This value will be TRUE if there is a pending :STOPCACHE.

CDT'SEQ'MINFTCH
If there is a prefetch for a sequential read ("miss"), the size of the prefetch is delimited by the extent size of the file. Within this limitation, the prefetch is equal to the greater of two sizes:
1) Requested size.
2) The largest integer multiple of the request size that is smaller than the value found in this cell.

The default value is 96 sectors. (This value may be changed via :CACHECONTROL).

CDT'RND'MINFTCH
This is the same as CDT'SEQ'MINFTCH except that it's for random access. The default value is 16 sectors. (This value may be changed via :CACHECONTROL).

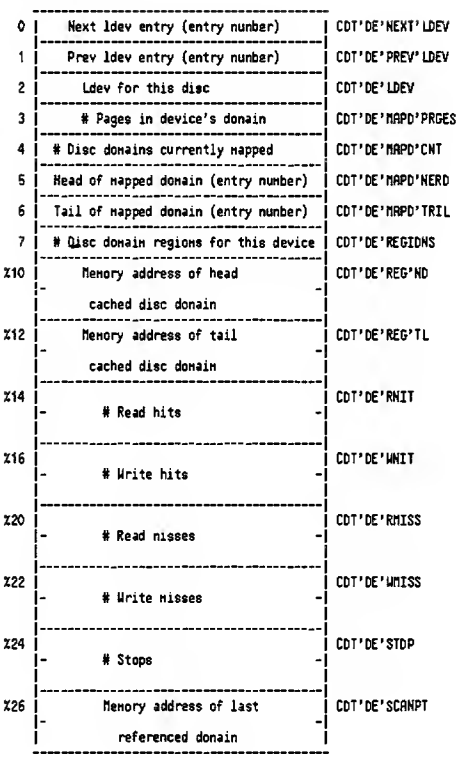
CDT'FORCE'POST
When this value is TRUE, all writes will "block" until the physical update on disc completes. The system default is FALSE. (Can be altered via :CACHECONTROL).

CDT'STOP'QUEUE
If CDT'STOP'PENDING is TRUE this will be the PIN number of the head pin of the processes impeded until the :STOPCACHE completes.





Device Entry








CDT'DE'NEXT'LDEV
The entry number of the next Device Entry.

CDT'DE'PREV'LDEV
The entry number of the previous Device Entry.

CDT'DE'LDEV
The ldev number for this cached device.

CDT'DE'MAPD'PAGES
Total number of main memory pages allocated to disc domains for this cached device. This includes mapped and unmapped regions. (1 main memory page = 128 words).

CDT'DE'MAPD'CNT
The total number of Mapped Domain entries associated with this Device Entry.

CDT'DE'MAPD'HEAD
The entry number of the first Mapped Domain entry for this device.

CDT'DE'MAPD'TAIL
The entry number of the last Mapped Domain entry for this device.

CDT'DE'REGIONS
The total number of disc domain regions for this ldev (includes mapped and unmapped regions).

CDT'DE'REG'HD
Memory address to the head region of the disc domain linked list. Disc domain regions are linked in order based on the disc address they represent (i.e. small disc address at head, large disc address at tail). This address will not point to the region base (RB), but to the next domain (ND) field of the region header. (This is to facilitate the use of the LLSH instruction).

CDT'DE'REG'TL
Memory address of the tail region of the disc domain linked list. This address will be of the previous domain (PD) field of the region header.

CDT'DE'RHIT
Total number of times that a read was requested and the requested disc domain was present in memory - i.e. a read "hit". This means that the read completed without performing any I/O (to fetch the domain). Thus this is actually the number of read I/Os eliminated. This value will reset to zero on overflow.

CDT'DE'WHIT
Total number of times that a write was requested and the requested disc domain was present in memory - i.e. a write "hit". If there was no other write pending to the "hit" domain, then the process would continue as soon as the cache move completes - thus eliminating a block for I/O. Otherwise, the process would block waiting for the first write to complete. This value will reset to zero on overflow.





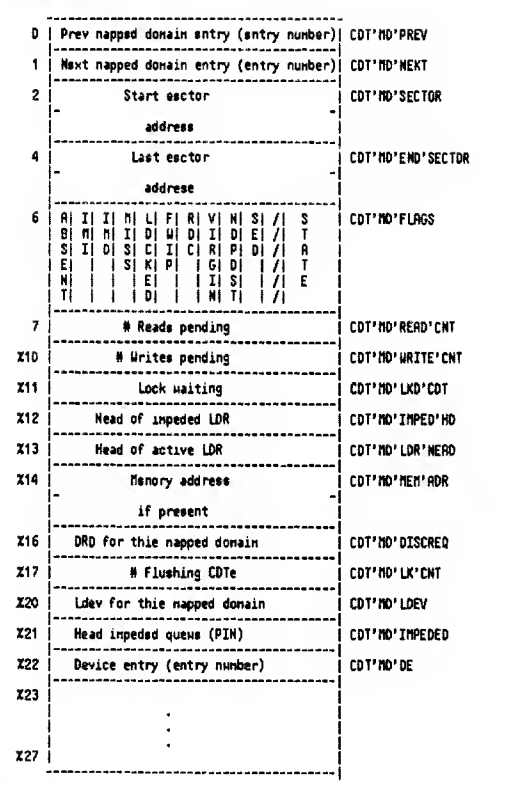
CDT'DE'RMISS
Total number of times that a read was requested and the requested disc domain was not in memory - i.e. a read "miss". This means that the requested disc domain had to be fetched into memory before the read could complete - thus potentially blocking the process. This value will reset to zero on overflow.

CDT'DE'WMISS
Total number of times that a write was requested and the requested disc domain was not in memory - i.e. a write "miss". This does not mean that the process would block until the disc domain is fetched as is the case for reads. Rather, a free memory region would be obtained to be the destination of the cache move. This disc domain would then be posted in the background (unless overridden via :CACHECONTROL or FSETMODE) allowing the process to continue without blocking. This value will reset to zero on overflow.

CDT'DE'STOP
Total number of times that a process had to block on a cache transfer. Will reset to zero on overflow.

CDT'DE'SCANPT
The memory address of the last region looked at on a search. This address will be of the next domain (ND) field of the region header. This value will be used along with CDT'DE'REG'HD to determine where to start the next search for a cached disc domain At times it will be more efficient to start with this address since the disc domain requested may be of a higher disc address than found in this region header, rather than always starting the search with CDT'DE'REG'HD.

Mapped Domain Entry








CDT'MD'PREV
Entry number of the previous napped domain entry for this device.

CDT'MD'NEXT
Entry number of the next napped domain entry for this device.

CDT'MD'SECTOR
The starting disc sector address representing this napped domain entry.

CDT'MD'END'SECTOR
The ending disc sector address representing this napped domain entry.

CDT'MD'FLAGS
Flags describing the stats of this napped domain entry and the region associated with it:

(0:1) - Absent.
Region is not present in memory.
(1:1) - IMX.
Region is already In-Motion-In. (Set when the fetch for this cached region is initiated).
(2:1) - IMO.
Region is In-Motion-Out. (Set by STARTOBJWRITE when performing the background post of a cached region).
(3:1) - MISS.
This disc domain was not present and had to be prefetched.
(4:1) - LOCK. Not used.
(5:1) - FWIP.
Forced Write In Progress. Region was forced out of memory to make room for another object.
(6:1) - ROC.
Recover Overlay Candidate. Region may be forced out of memory to make room for another object. However, if this region is referenced again it can be recovered.
(7:1) - VIRGIN.
Clean region in the write state. Cleared as soon as a move completes. (I.e. if this bit is on, then a write can complete immediately. Otherwise the write will have to wait until the current write completes the physical post).
(8:1) - NOPOST.
Set when the CDT is being posted out as a result of a write request that did not want to wait for the physical post to complete. This will be cleared by the cache completor when the physical post completes. (This is used to insure that a cache move for any subsequent write request will not be serviced until the physical post completes.)
(9:1) - SEQ.
Set if doing sequential I/O. When the request for the last area of this disc domain is complete, this domain will be made a ROC.
(10:3) - Not used.
(13:3) - STATE
0 - AVAIL. CDT is an available entry.





1 - READ. Only read LDR(s) are attached.
2 - WRITE. Write LDR(s) and possibly read LDR(s) are attached.
3 - FLUSH. CDT is being flushed out.
4 - LOCK. Unused.

CDT'MD'READ'CNT
The number of LDRs attached that are for reads (move not complete).

CDT'MD'WRITE'CNT
The number of LDRs attached that are for writes. NOTE: This count will not be decremented until both the cache move and the physical write complete. However, as soon as the cache move complete, the LDR will be dequeued from the CDT.

CDT'MD'LKD'CDT
Not used.

CDT'MD'IMPED'MD
The first LDR that is impeded. (I.e. the CDT is in a write state already and another write is attached. The second write will be placed in this queue until the first write complete.)

CDT'MD'LDR'HEAD
The first LDR that is on the active list for this CDT.

CDT'MD'MEM'ADDR
The memory address (region base) for this napped disc domain, if present.

CDT'MD'DISCRED
The disc request table index associated with this mapped disc domain. This will be used to fetch this region in, or to post this region after any logical I/Os (writes) have completed. (I.e. this DRD is used for the physical I/O.)

CDT'MD'LK'CNT
Not used.

CDT'MD'LDEV
The ldev number for this napped domain.

CDT'MD'IMPEDED
The PIN for the first process impeded on this napped disc domain. Processes get impeded here when they do WRITFDRID when their LDR is on the CDT impeded queue and the Mapped Domain is currently being written out. (This will also happen upon a :STOPCACHE to force all LDRs to complete.) As soon as the physical post of the Mapped Domain is complete, all processes impeded here will be awakened.

CDT'MD'DE
The entry number for the Device entry that this Mapped Domain entry is associated with.





Logical Disc Request Table

X1D17 Pointer to Logical Disc Request Table

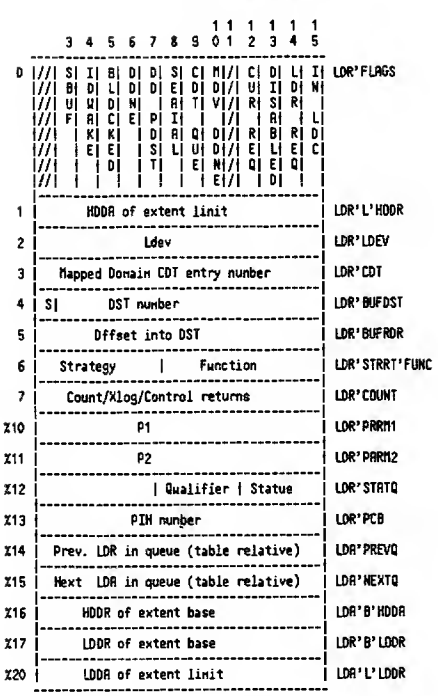
NOTE:
This table is really part of the DRD (Chapter 13). Any entry with the logical request bit set in the flags will conform to this format and not the format of the standard DRD.

Logical disc requests entries are used to manage requests between the requesting process and a napped disc domain. They are the counterpart of disc requests entries used to manage physical I/O requests between a process and a disc. These entries are kept as part of the DRQ Table, but will never be queued to the disc's DIT, instead they will be queued to the napped disc domain CDT entry. LDR entries may only be placed onto the following queues:

1) The CDT active list.
2) The CDT impeded LDR list.
3) The Disabled Disc Request. (This will only happen if the buffer segment is absent when the logical I/O (cache move) is attempted.)

NOTE:
LDRs are singly linked onto the CDT queues and doubly linked onto the disabled disc request queue.

Logical Disc Request Entry








LDR'FLAGS
Flags.
- (0:3) - Hot used.
- (3:1) - SBUF.
  Set if request is to/fron a System Buffer.
- (4:1) - IOWAKE.
  Set if system should wake up the process when the logical I/D completee.
- (5:1) - BLOCKED.
  Set if the process wants to wait for the logical disc request to complete.
- (6:1) - DONE.
  Set when the logical disc request is complete and the process will be awakened (if IOWAKE is set)
- (7:1) - DD'PDST.
  Set if the caller wante to be waited until the physical post to disc completes. Only valid for write requests.
- (8:1) - SERIAL'PDST.
  Set when the physical post should be through the Global Serial Write queue.
- (9:1) - CDT'QUEUED.
  This request has been queued - either onto the CDT active queue (see CDT Mapped Donain entries) or onto the disabled disc request list.
- (10:1) - MOVE'DONE.
  The nove has been completed, but the process won't be awakened until the DONE bit is set.
- (11:1) - Hot used.
- (12:1) - CUR'REQ.
  Set if this request is the current/active request.
- (13:1) - DISABLE.
  Set if the request is disabled.
- (14:1) - LDR'REQ.
  Set if this is a logical disc request.
- (15:1) - LDR'INLDC.
  Set if Mapped Donain CDT entry is in process's locality list.

LDR'L'HDDR
The High Order Disc Address of the extent limit. (See note with LDR'B'HDDR).

LDR'LDEV
The ldev for this request.

LDR'CDT
The CDT nunber for the Mapped Donain entry associated with this request.

LDR'BUFDST
Data Segnent nunber for the target of the logical I/D request. If bit zero is set, then this is the process's stack.

LDR'BUFADR
Offset within the DST (above) for the target address. If the DST is the process's stack, then this address will be DB relative.





LDR'STRAT'FUNC
(0:8) - Strategy
- 0 - Unknown caller
- 1 - Unknown File System
- 2 - Spooler
- 3 - Directory
- 4-7- Unknown caller
- 8 - Genmessage
- 9 - File System, Quiesce I/O
- 10 - File System, Sequential, No Buf
- 11 - File System, Direct, No Buf
- 12 - File System, Sequential, Buffered
- 13 - File System, Direct, Buffered
- 14 - File System, KSAM
- 15 - File System, IMAGE

(8:8) - Function
- 0 - Read
- 1 - Write

LDR'COUNT
On initiation, this specifies the requested transfer count (+words, -bytes). Rt completion of the request, this contains the actual transmission count (+words, -bytes).

LDR'PARM1
This is the High Order Disc Address of the requested disc sector.

LDR'PARM2
This is the Low Order Disc Address of the requested disc sector.

LDR'STATQ
Uniform status returns.

LDR'PCB
PIN of the requesting process.

LDR'PREVQ
Table relative index of the previous LDR in the queue. (NOTE: LDRs are singly linked on the CDT queues, and doubly linked on the disabled disc request queue).

LDR'NEXTQ
Table relative index of the next LDR in the queue.

LDR'B'HDDR
The High Order Disc Address of the extent base. (Used when the logical disc request is through the file system. Caching uses this information when searching memory for a "hit" on a cached domain).

LDR'B'LDDR
The Low Order Disc Address of the extent base. (See note above).

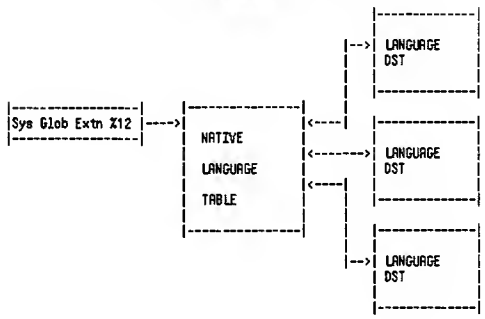
LDR'L'LDDR
The Low Order Disc Address of the extent limit. (See note above).

# CHAPTER 24 NATIVE LANGUAGE SUPPORT

## NL/3000 Internal Table Structure

NLS FILE CODES
LANGDEF.PUB.SYS - 1228
CHRDEFXX.PUB.SYS - 1229
NLSDEF.PUB.SYS - 1229

### Native Language Support (NLS) Table Overview



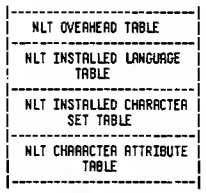





### Native Language Table (NLT)

This table is created by INITNLS (called by PADGEN). The DST number is contained in SYSGLOB extension X12. The Native Language Table (NLT) contains the description of all the character sets needed to support the installed languages, and additional information needed to support the configured languages (DST numbers of the languages associated DSTs, character sets, etc.).

Every installed language has had an associated Language DST, set up by INITNLS.

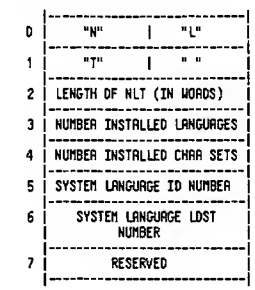







### NLT Overhead Table

The NLT overhead table is 8 words long.

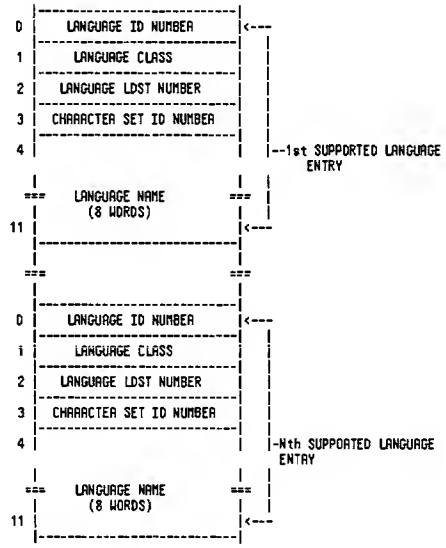






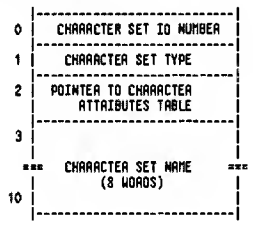

### NLT Installed Language Table Format

For each of the supported non-NATIVE3000 languages there is a 12-word language entry.



## NLT Installed Character Set Table Format

For each character set installed on the system there is an 11 word character set table. It has the following format:

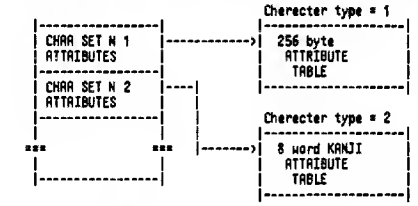







## NLT Character Attributes Table

The NLT Character Attributes Table is comprised of a table for each configured character set. At this time, only two character sets are configurable: Class Four Languages (KANJI-based) and Noncless Four Languages.




The type = 1 attributs table is a 256 byte table. Each byte corresponds to a character with that octal value.

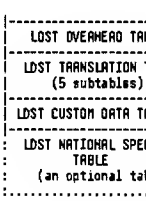
Attributs 0 - numeric character
1 - special character (e.g. "!", "?", "." etc.)
2 - alphabetic uppercase character
3 - alphabetic lowercase character
4 - control code
5 - invalid character (unused code)





## Language OST

For each language installed on a target system (with the exception of NATIVE-3000) INITNLS will build one language OST with the following structure:

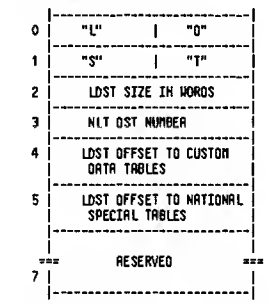







## LOST Overhead table

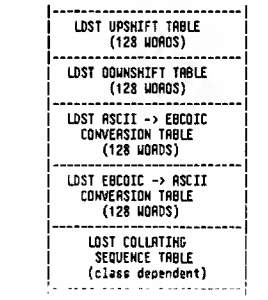
The overhead region has the following format:




The national special table is optional. If it does not exist, the pointer to it is zero.

## LOST Translation Tables

For each language a number of translation tables are stored:



## LDST Collating Sequence Table

The LDST Collating Sequence Table is of different formats depending upon the class of the language.

### Overview

**Class One Languages:** Some languages, namely American English and Katakana, can be be collated by using the numerical representation of the ASCII encoding as the sequence number for any given character. These languages can use the Compare Bytes machine instruction.

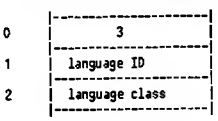
**Class Two Languages:** Some languages may be able to use the COBOLII machine instruction, Compare-Translated-Strings. These languages need to have a one-to-one mapping of character encoding to sequence number. Any algorithm for this class of language must take into account the fact that not all HP 3000s have the COBOLII firmware.

**Class Three Languages:** Many languages will not be able to use either of the tactics described above. There are a number of language-dependent algorithms that need to be supported.

**Class Four Languages:** Some languages require 16-bit character string encoding. Collating these languages is not supported. The collating sequence table for this class of language is reserved.

### Class One Languages

Since class one languages will use the conpare bytes machine instruction (CMPB), the whole collating sequence table for this class is 3 words.

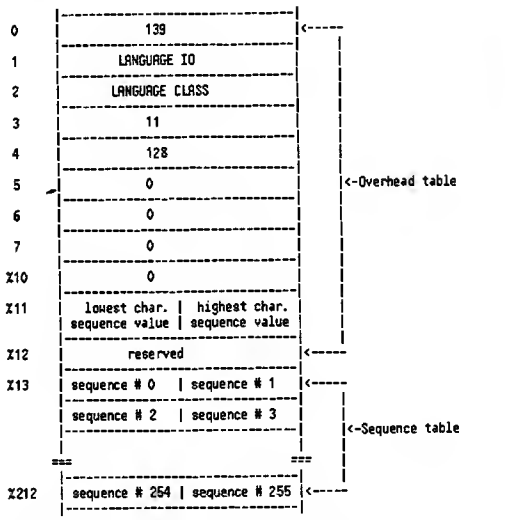







### Class Two Languages

This sequence table has a 13-word over head table and a 128-word sequence table.




Note: Word X11 of the overhead contains in the left byte the the character value, which has the lowest sequence number and in the right byte the character value, which has the highest sequence number.

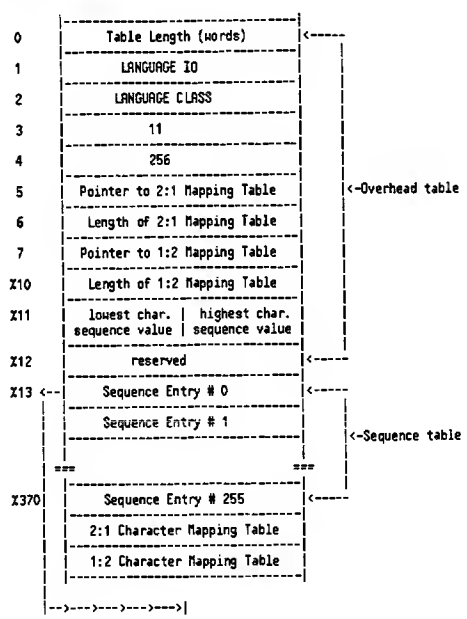
In the 128-word sequence table, the byte value of the character is used as a byte pointer in the collating table.

The byte value of the character is used as a byte pointer collating entries.





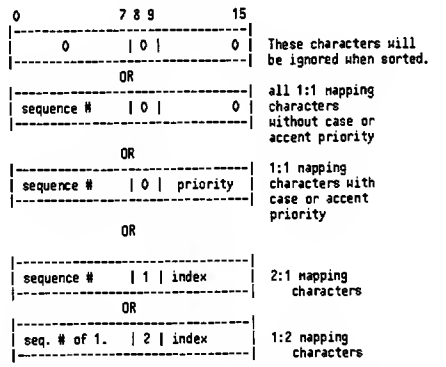
### Class Three Languages





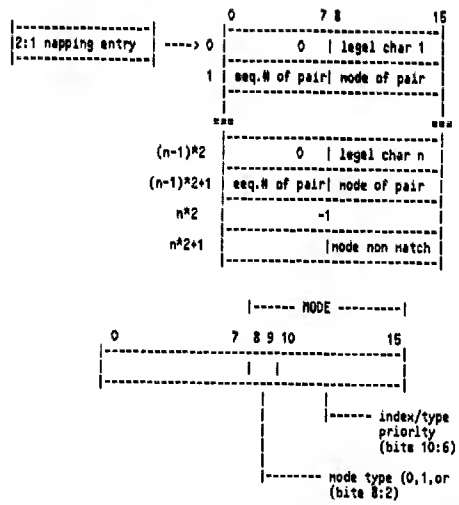



### Class Three Languages (Cont.)




The byte value of the character is used as an index to the sequence entries.

2:1 Character Mapping Table

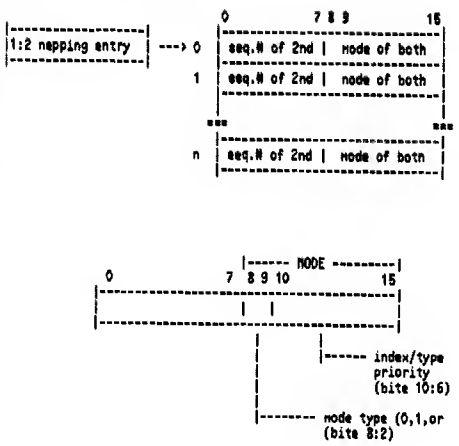



Entry has same format as node options in the LOCT Collating Sequence Table Format for Class Three Languages.





1:2 Character Mapping Table



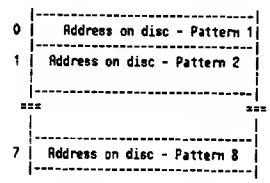

Entry has same format as one above.





Class Four Languages

Class four languages require 16-bit character encoding. Sorting in class four languages is not implemented in this release of NLS. A preliminary collating sequence table is planned to be 8 words in length.

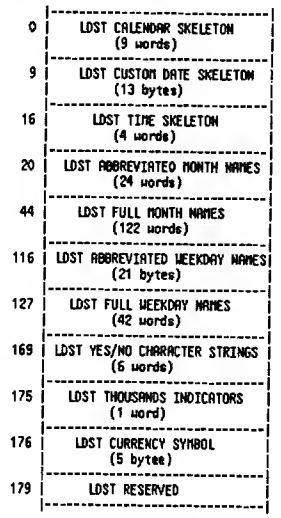







LOCT Custom Data Table Format

This table is 196 words long. The formats and information in this table are language dependent, and may be modified with LANGINST.PUB.SYS.



## LDST National Special Table

This table is optional and its existence is signaled by a nonzero pointer in the LDST overhead region. It is used to store data unique to a given language -- e.g. the Emperor data the for the Japanese calendar.

| Length |
|---|
| national dependent data |

## Date Formats for Japan and Taiwan

For a given language, there is only one date format possible. The format of the year stored in the date format of the LDST can either be yyyy or yy for the Julian dates or Nyy for either the Japanese date (Emperor Era) or the Taiwanese date foundation of republic date).

If the format of the year stored as the date format in the LDST is Nyy then either the Japanese emperor dates or the Taiwanese foundation date has to be stored in the national dependent table.





## National Dependent Table Formats

| | |
|---|---|
| %0 | length of table(words) |
| %1 | id |
| %2 | number of entries |
| %3 | num of HP supplied entr. |
| %4 + %5 | period entry 1 |
| | ... |
| (2n+2) + (2n+3) | period entry n |

The period entries are two word entries of the following format:

| 0 6 | 7 15 | |
|---|---|---|
| year of century | day of the year | word 1 (starting date) |

| 0 7 | 8 15 | |
|---|---|---|
| starting year | emperor symbol | word 2 |

The ID for Japanese and Taiwanese date formats is always set to 1.





## Japanese Date Format

There are three entries which do not change. The user can add new entries. These entries have to be stored in ascending order sorted by word 1.

The values of the entries are:

| | starting date (MDY) | octal value | starting year | emperor symbol |
|---|---|---|---|---|
| * | 1/ 1/1873 | %1 | %41 | M |
| | 7/30/1912 | %14324 | %1 | T |
| | 12/25/1926 | %32547 | %1 | S |

* since this starting time is in the 19 th century and we are not able to handle dates before 1900 easily, we store %1 as starting time.

For new date entries created by the customer the starting year will always be 1.





## Taiwanese Date Format

There are two entries for the Taiwanese national dependent table.

The values of the entries are:

| Starting date (MDY) | Octal value | Starting Year | Emperor symbol |
|---|---|---|---|
| 1/ 1/1900 | %1 | %0 | %40 |
| 1/ 1/1912 | %14001 | %1 | %40 |

The user does not need to add new entries.

## READER COMMENT SHEET

**MPE V Tables Manual for MPE V/E, Version G.01.00**

**32033-90040 January 1985**

We welcome your evaluation of this manual. It is one of several that serve as a reference source for HP 3000 Computer Systems. Your comments and suggestions help us to improve our publications and will be reviewed by appropriate technical personnel. HP may make any use of the submitted suggestions and comments without obligation.

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